THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIX. No. 2181.] LONDON, FEBRUARY 28, 1905. [57TH YEAR. PRICE 6d.

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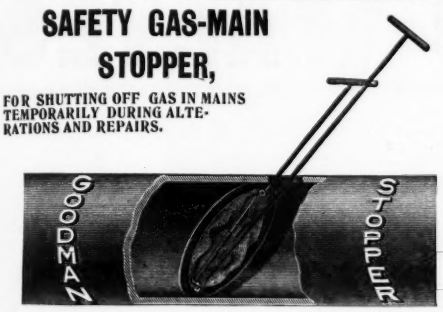

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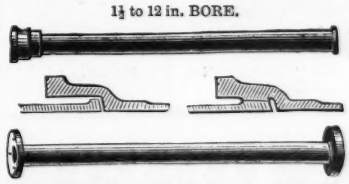

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Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

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Fig. 705. "SINGLE RAM" STEAM-PUMP.

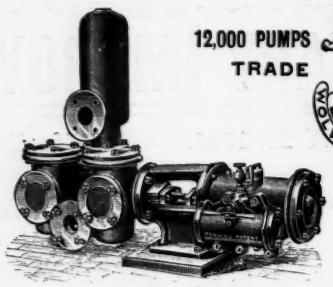

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

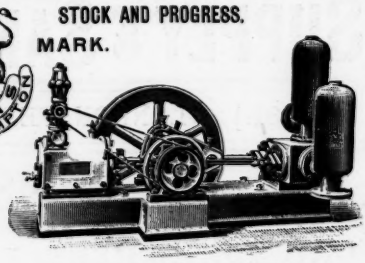

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

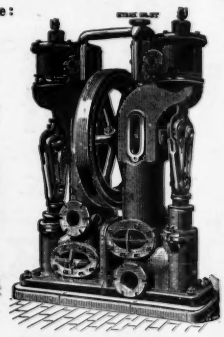

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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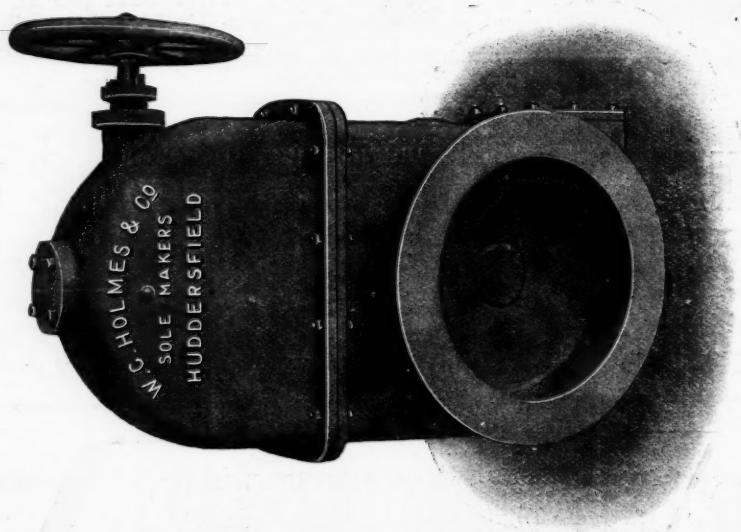

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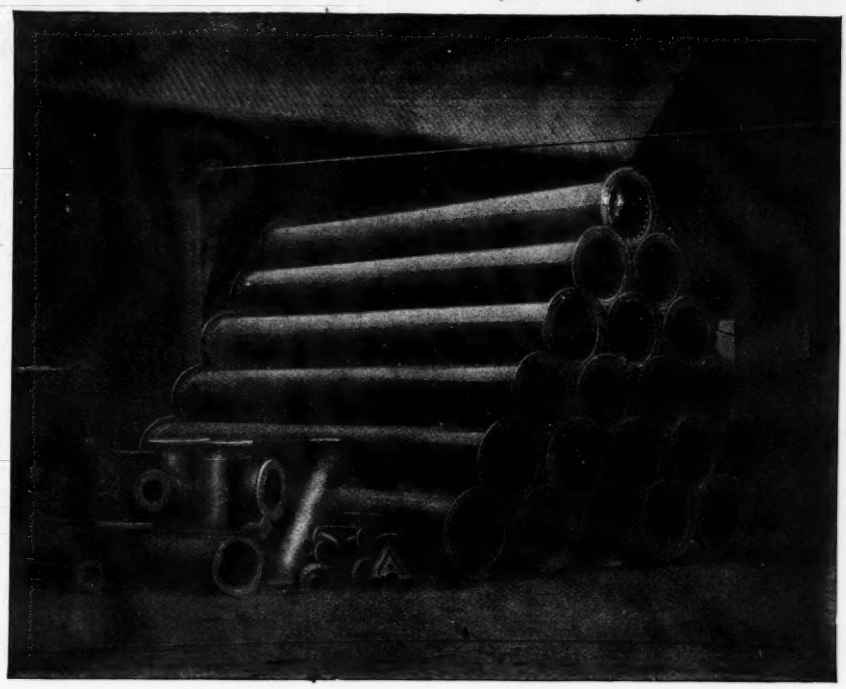

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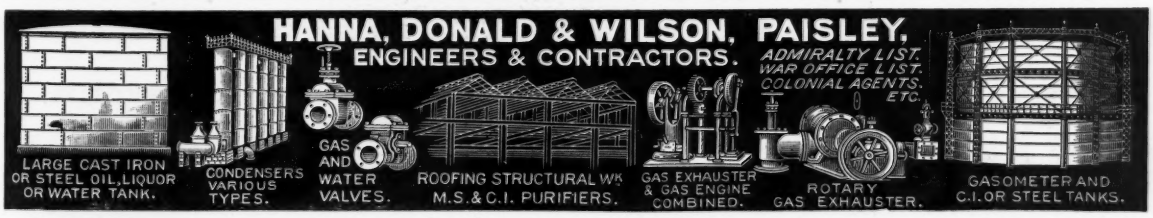
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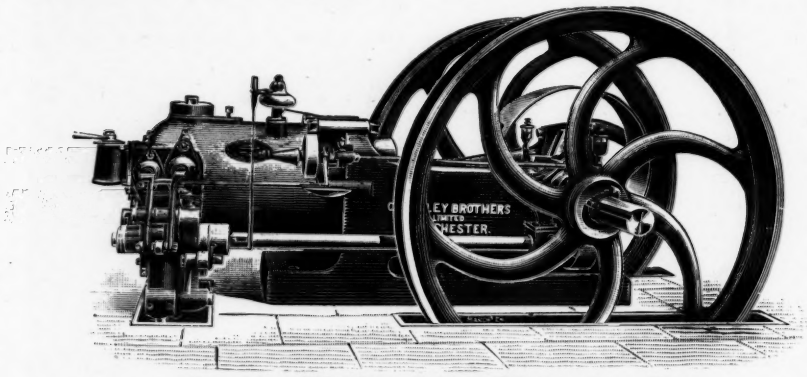

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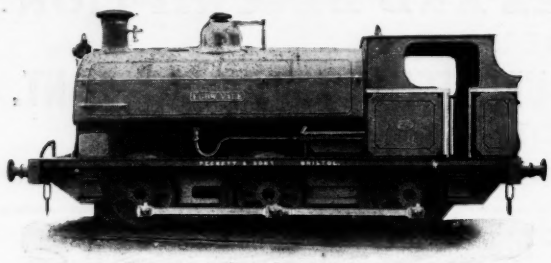

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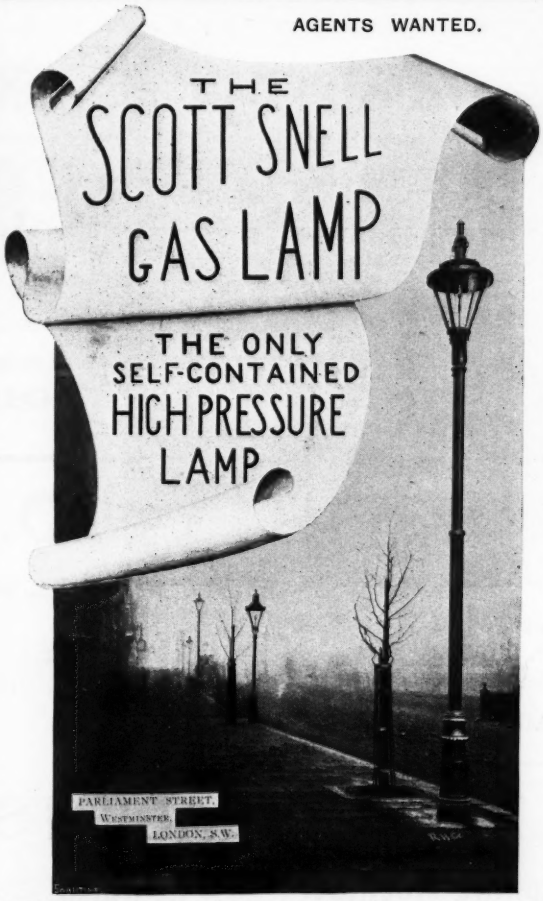

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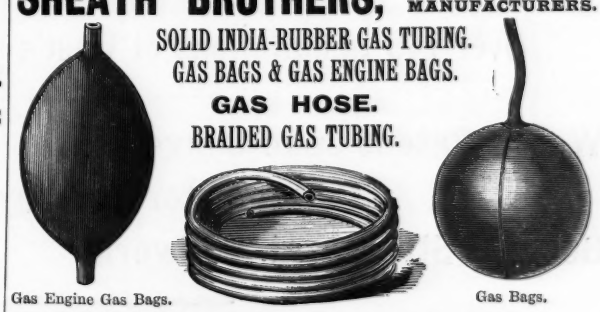

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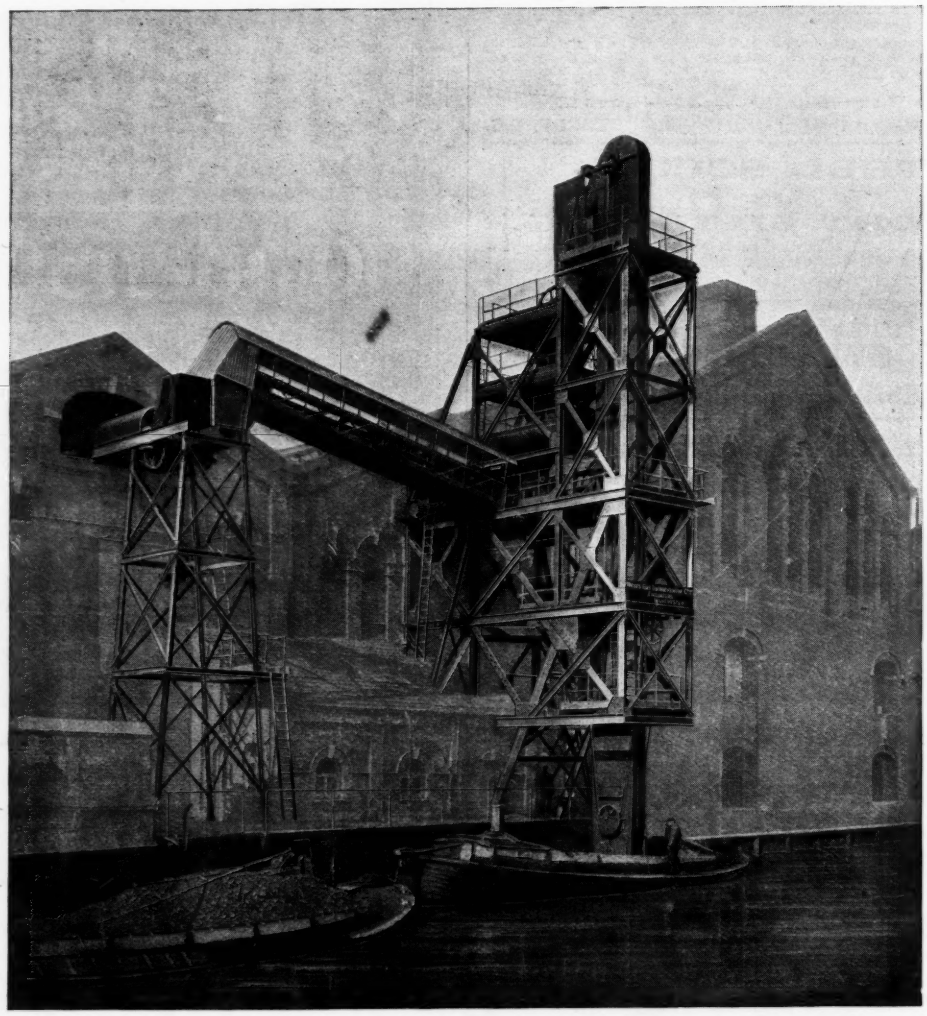

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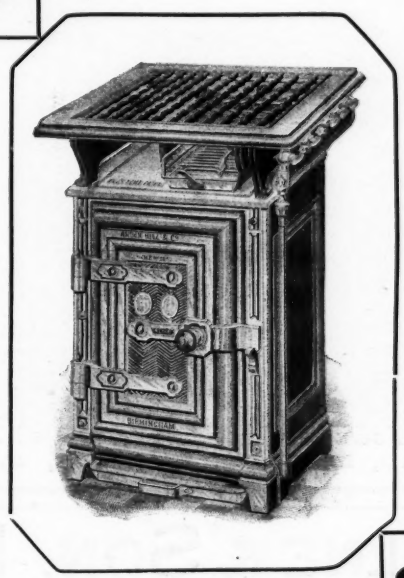

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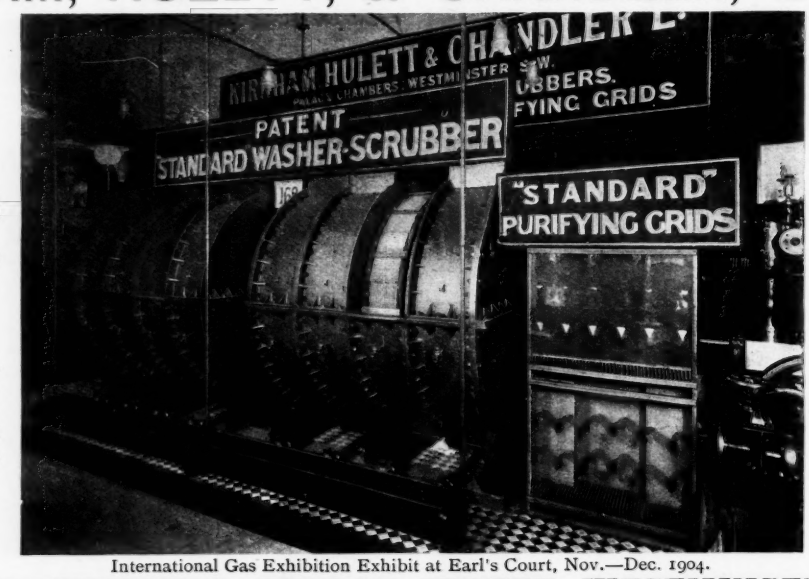

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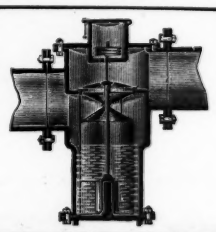

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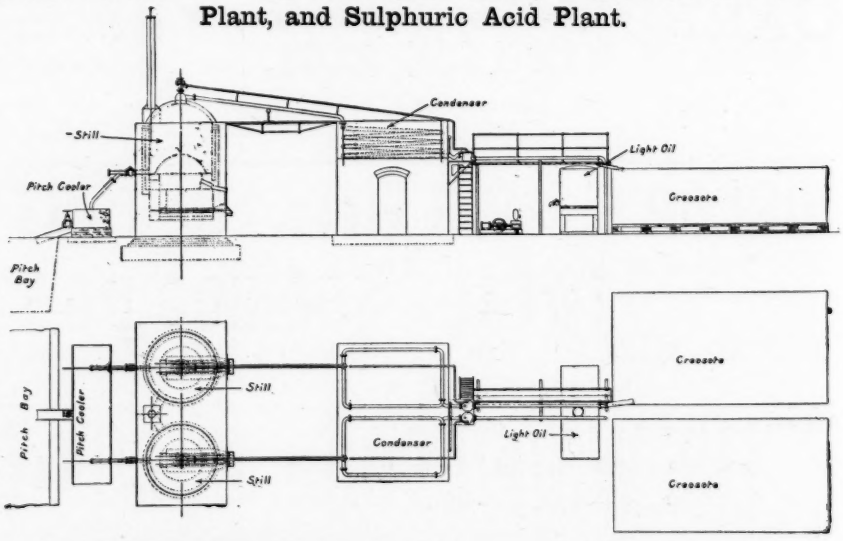

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EDITORIAL NOTES—GAS, &c.

Gas Legislation for the Metropolis.

REFERENCE has been made in these columns on more than one occasion to the fact that the circumstances attending the promotion of the Bills which are now before Parliament ought to make it a matter of no very great difficulty for the London County Council and the Gas Companies to arrive at an agreement, and thus avoid the cost of a parliamentary contest. That no such agreement has as yet been arrived at is not, there is reason to believe, to be attributed to any desire on the part of either side to "back out" of the negotiations, but probably arises from a not unnatural reluctance to exchange confidences at the outset. The position is one of some little, though by no means insurmountable, difficulty. The Companies have for many years been treated by the Council with suspicion most unworthy and unwarrantable; and every effort made by them to bring their industry into line with modern requirements has been strenuously opposed by the latter with all the power and influence that a public purse can command, and by all the reactionary evidence that could be raked together from all parts of the country. A round-table conference under such circumstances would be an absolute impossibility, were not the desire for it to be regarded as a return, on the part of the Council, to a juster view of what is due to the Companies. They are entitled to be treated with confidence, and not with suspicion, any return to which should be fatal to the negotiations. With such treatment it is not likely that Parliament will be found to have any sympathy. The Companies are, however, entitled to more than this. They are entitled to know and to feel that those who are in authority over them—officials no less than the representative bodies—are capable of taking a broad view of the position as regards them, and not merely of acting towards them in the light of policemen or of detectives. They are entitled to credit being given them for common honesty and a desire to serve their customers to the best of their ability, knowledge, and experience, and to full recognition of the fact that they and the consumers are, by virtue of the sliding-scale arrangements, partners; the interest of the latter predominating, inasmuch as their gain or loss by every act of the Companies is four or six times that of the latter. They are also entitled to realize that the functions of a public body are not confined to registering the will of a permanent official, however able, but are administrative in the best sense of the word, and so as to conduce to the best interests of the consumers it is supposed to represent.

There are minor points in the Bill promoted by the London County Council which are hardly worth troubling a Parliamentary Committee with. Upon the question of the penny reduction in the standard prices, the Companies may be expected to stand firm; nor is it easy to see upon what ground the Council can defend their proposal before a Committee. As was pointed out by Sir George Livesey at the recent half-yearly meeting of the Gaslight and Coke Company, these standard prices have all been revised during the last five years. The proposal to alter them is therefore less than reasonable; besides which it is in direct opposition to the finding of the Board of Trade Committee on the subject. This was, that the pecuniary advantage of the proposed relaxation of the requirements with respect to sulphur purification is not, in itself, sufficient to justify any consequential reduction in the price of gas. In most other respects, the Bill promoted by the Council follows the recommendations of the Committee with almost scrupulous fidelity. Why should this have been made an exception to the rule which its framers so evidently set out with the intention of observing? Was it because it passes the wit of Spring Gardens to devise a revision of the present arrangements of the sliding-scale, and (to quote the words of the report) "substitute for them arrangements in which "the standard price and rate of variation of dividend would "be fixed so as to give the Gas Companies greater incentives "to economy, while being equally favourable to the public "under normal circumstances?" Surely not; but, if so, it would not excuse so crude and illiberal a substitute.

We do not pretend to know what is in the minds of the Companies on this point; but it is conceivable that they would not object to a recasting of the sliding-scale arrangements on the lines recommended by the Board of Trade Committee. Some trouble might have been saved had the latter devised a new sliding-scale in accordance with their suggestion; but the problem they have propounded cannot be regarded as an unsolvable one. One difficulty in the way is perhaps the difference in the prices now charged by the three Companies. But for the Company charging the highest price some compensation would be available by the acceptance of the method of testing for illuminating power prescribed in the Companies' Bill. Taken in conjunction with this, a reduction of (say) 1d. in the initial prices, with an addition of 4d. per cent. to the sliding-scale dividend, making this 3s. instead of 2s. 8d. for every penny reduction or increase in the price of gas, might be found practicable. Some such proposal, at all events, deserves most careful consideration by all concerned, although, with all due respect to the Board of Trade Committee, the Companies need no further inducement to reduce the price of gas to the lowest possible figure. We are equally of opinion that any considerable increase in the increment of dividend dependent upon the price of gas would not be to the interests either of the Companies or the consumers.

The Future of the Paris Gas Supply.

WE do not think it will be using exaggerated language to say that one of the principal events of the past week for the citizens of Paris was the adverse decision of the Senate on Thursday, on the scheme submitted to that body for the municipalization of the gas supply upon the expiration of the Company's concession at the close of the present year. Our readers will doubtless remember that a Bill had come up from the Chamber of Deputies to sanction the raising of a loan of 120,000,000 frs. for the acquisition of the Company's undertaking, and to organize a scheme for its management under the direct control of the Municipality. This scheme, as mentioned in the "JOURNAL" for the 7th inst., had been considered by a Committee of the Senate, who had reported unfavourably upon it, for reasons which have been already indicated. The report, which was a most exhaustive one, was signed by M. Charles Prevet; and its conclusions were, briefly, that the proposed loan should be limited to 100,000,000 frs., to allow of the purchase being made, and that the actual service should be carried on under a concession. The conclusions arrived at by the Committee were supported by several of the most influential papers in Paris; but, on the other hand, the advocates of municipalization expressed themselves equally strongly in favour of the scheme submitted by the Chamber, which, moreover, had the sanction of the Government. The views held by this party were laid before the Senate by M. Paul Strauss in the course of the debate on the Bill, which opened on Tuesday. He combated the conclusions arrived at by the Committee, and warned the Senate that acceptance of them would bring the city face to face with the Gas Company, seeing that all the various combinations which had been formed to take up the supply as from the beginning of next year had fallen through. He pointed out that the present was not by any means the first occasion of a public service being municipalized, without causing impairment of either commercial or industrial freedom. No aversion had been shown to taking over the monopoly of the supply of tobacco and matches; therefore the Senate had no right to systematically reject the municipalization of the supply of gas. M. Strauss cited cases of municipal control existing in this country and elsewhere in support of his argument, and he claimed that their success would justify the Senate in adopting the proposals of the Chamber.

On Thursday, M. Prevet replied categorically to the

remarks of M. Strauss, and defended the position taken by the Committee. He laid stress upon the point that municipal control under a monarchy and a Republican Government are very different things. He contended that in the case of an undertaking in the hands of a municipality there is no direct responsibility; whereas if a concessionnaire has control of it, he will be on the alert to defend his honour and also protect his funds. M. Prevet, like his predecessor, alluded to the conditions of gas supply in England, but it was to furnish proof that gas is sold at a lower figure by companies than by local authorities. The point he wished to make was that, on the whole, the consumer fares better under the former than under the latter. "Who," he asked, "would defend the consumer, if the system of direct muni-"cipal control were adopted in the case of the gas supply of "Paris?" His question was a very pertinent one, and it was received with prolonged applause. He concluded by appealing to the Senate not to do anything to swell the ranks of officialdom, but to leave municipal authorities and the State to exercise their legitimate functions, which were merely to control. The Minister of the Interior (M. Etienne) begged the Senate to agree to the proposal adopted by the Chamber, as the Government would not, he said, be able to submit another, and time was getting short. He expressed the opinion that the adoption of the new *régime* would not be attended with the danger which had been feared, owing to the precautions taken in drafting the Bill. The finances of the gas service would be kept entirely distinct, and therefore would not disturb the balance of the general budget. He warned the members that by the rejection of the scheme a great risk would be run, owing to the limited time now remaining for making the necessary arrangements for the continuance of the service. The President having closed the discussion, a vote was taken, when the proposed reduction of the loan to 100,000,000 frs., repayable out of the revenue derived from the sale of gas, was agreed to by 136 votes to 115—a majority of 21 out of 251 voters. The proposals of the Chamber for direct municipal control were then submitted and rejected.

The decision of the Senate has given a decided set-back to the municipalization of the gas supply of Paris, and the Socialists are consequently greatly enraged at it; but the more sober-minded of the inhabitants, judging by the comments in their representative organs, are rather gratified than otherwise that the "*régicides*," as they are facetiously called, have overmastered their opponents, though the majority is not very large. It is thought that the rejection of the Government scheme should not cause one moment's regret to anybody. At the same time, it has placed the Municipality in a position which is sufficiently serious to call for immediate attention. In ten months the Gas Company's concession will expire, and no definite arrangements have yet been made for continuing the important work they are carrying on. It is therefore deemed advisable for the Prefect of the Seine to call the Council together early in March to consider what is to be the next move in this rather intricate game. Now that the spectre of the *régie directe* has been effectually laid, a hope may be expressed that the members of the various political parties composing the communal chamber will set their differences aside, and apply themselves seriously to the settlement of a scheme which will conserve the interests alike of the consumers and the City. It seems now to be fairly certain that the supply of gas in the future will be carried on under a concession, the broad lines of which it should not be difficult to lay down; indeed, they have already been indicated in the report recently before the Senate. But apart from these, it is considered in certain quarters that whoever obtains the concession should do so on the understanding that the present price of gas—which is equivalent to 4s. 6d. per 1000 cubic feet—should be the maximum. Such an outrageous figure as 6s. 9d., to which Parisians had to submit for so many years, ought never to be reverted to. Then he should be called upon to reduce by (say) 50 per cent. the incidental expenses of laying on a service, and continue the present system of free fitting in the case of small consumers. Further, he should take over, at his own cost, the portion of the assets belonging to the existing Company under their Treaty of 1870; and he should also guarantee a minimum payment of 19,000,000 frs. per annum into the municipal exchequer. A concession worked under these conditions would, it is believed, be productive of far better results than those claimed even by the partisans of direct management. Certainly, with such a carefully prepared scheme, the City would not incur any great risk, but, on the contrary, would derive a legitimate and lucrative revenue from an important section of her industrial domain. Whether any person or public body will be prepared to take the concession upon these terms is a matter into which we need not inquire. But something must be settled without delay, if the present efficiency of the gas supply, which justly entitles Paris to be called the City of Light, is to be assured in the future. The question is one of great urgency.

The Midland Association Meeting—
Education and Investigation.

THE mythological Argus, had he been present at the meeting of the Midland Association last Thursday, would have found himself somewhat put about had he gone there with the intention of keeping an eye on every subject that was brought to the attention of the members. The *agenda* was not even an indication of the omnifarious character of the resulting proceedings; and so we cannot hope here to focus the consideration of readers upon the whole of the material which was spread with liberal hand before the members. The President succeeding Mr. George Helps is Mr. Thomas Berridge, of Leamington. His Inaugural Address formed, though unconsciously so at the time it was written, a fitting prelude to the papers, and, in effect, an answer to those who fail to see, if not the usefulness, the possibility of carrying out a suggestion brought before the members at a later stage by Mr. Harold E. Copp. Education is the stepping-stone to scientific attainment, this attainment to the application of Science to investigation, and the useful results of investigation to the circumstances and methods of every-day life and industry. And in this way we progress. The education of the budding members of the gas profession supplied the substance of Mr. Berridge's address; the personal experiences in daily practice drawn by him in the earlier and later parts of the address are sufficient argument for his claim to greater consideration for specialized instruction. He spoke of new aids to purification, of the increased make of gas per ton of coal in recent years, of cyanogen recovery, naphthalene removal, incandescent lighting, and of new methods of retort charging and discharging. These things are not the fruits of rule-of-thumb working; they are the fruits (and not by any means the whole) of education and the application of scientific research and thought. But of such are the influences which have produced the strength of the industry during the last quarter of a century. In other words, the gas industry would not have made its wonderful progress, and indeed would not have, to use an expression which falls so blithely from the tongue of the gas company chairman, "held its own," if Science had not been directed to the production of these benefits in manufacture and utilization. Science produced the regenerative furnace for the work of carbonization; Science claims the incandescent system of lighting at the head of the methods of utilization. But though Science has done so much for the gas industry, what have those directly interested in the industry done for Science? Because Science has done much, we must not rest contented. At the base of Mr. Berridge's advocacy of further means of attaining scientific education for the young gas man, lies the question, How are we to further help forward the progress of the industry? The President's reply is "Educate;" and it has the sympathy of most thinking men. We cannot rest on present achievement. Other competitors are prosecuting hard the research to supplant the gas industry in economy—electricity in lighting; producer gas in power. Science brought them into being; and it is the aid of Science that has been sought in attaining higher efficiency. Other illustration is found in the President's direct reference to the chemical industry of Germany. We want in the gas industry to go on progressing; and as Science has helped us so much in the past, does it not follow that the greater the amount of scientific training that can be brought to bear—the greater the amount of Science pervading the work of the practical engineer and manager—the more extensive will be its application to the work of the industry, and the more abundant its progress? We must pay our tribute to Science for what it has done for the industry; and if we want to do yet greater things, Science must be aided by a larger number of men capable of applying its teachings. Therefore we say that those who

think as the President does, and whose aspirations are not of that selfish order which looks only to immediate gain, will be serving the best interests of the industry from which they derive the means of existence, by urging on all available occasions the necessity of opening the channels to cultivation in those branches of knowledge which will be of assistance to the industry's special work. Those who scoff are generally those who have done the least in contributing to that progress in the rewards of which they are permitted to have a part.

The paper by Mr. Harold E. Copp takes us as it were into one of the bye-lanes of the same road of thought. He advocated the establishment of a Technical Investigation Committee by the Association; and his paper—pointing out the unsettled opinion which exists on many topics, and indicating his personal views formed by his own research into divers matters—supplied in itself, and in the discussion which it evoked, the best of argument for the establishment of such a Committee, and also for the application of more scientifically cultivated minds to the solution of the industry's problems. In the paper and in the discussion, there was a great deal said about the utilization of blue water gas in profitably developing, from the gas maker's point of view, the produce of (say) a ton of coal. We are as far off agreement on this matter as ever; and even results which were at one time defended are now overthrown, while of other results the authors still certify their truth. The most important contribution to the discussion in this connection was made by Mr. J. H. Brown, who has now obtained results (by the countenance given him in his investigations by the Gas Committee of the Nottingham Corporation) which, through the care and method bestowed upon the work producing them, may be, he says, accepted as thoroughly reliable. His statement and the figures he now publishes will renew interest in this subject; more especially seeing that the outcome of the experiments is going to greatly influence the policy of the Nottingham Gas Department. Then, again, it will be seen that there is little decided opinion among gas managers on the subject of the potentialities of producer gas as a competitor for power purposes; and the matter urgently calls for investigation. For power purposes, electricity is not so formidable a competitor for the suppliers of town's gas to meet as producer gas, and (according to those gas engineers who have inquired into the subject) particularly the suction-gas type of plant. Through the threatening of the suction-gas plants in Nottingham, Mr. Brown recommended his Committee, and they adopted his advice, to reduce the price of gas to 1s. 6d. per 1000 cubic feet for power purposes. There is not a single suction-gas plant in Nottingham to-day! But there are indications that Mr. Brown is not satisfied this is the price that will continue to ward off competition from this source. On the other hand, Mr. Bell is quite satisfied that from 1s. 6d. to 2s. will answer for keeping this class of business; and Mr. George Helps is equally satisfied that consideration will have to be given to an even lower figure than those mentioned. Experience has made it clear that the charge for town's gas supply for motive purposes may be something beyond the cost of producer gas for any given horse power. The relative efficiency of the two gases measured by the bare cost of the horse power developed is not a sufficient comparison. There is something beyond this that is worth money to the user of motive power, and that is the relief which the ordinary gas supply can give him (furnished at a reasonable price) from all anxiety, trouble, and initial and other expense which the introduction of a producer plant of the kind brings upon him, to say nothing of the smaller wear and tear on his engines by, and the convenience of, the use of the town gas. Even such things as these have their price, though difficult to exactly determine. But a too generous view must not be taken of them; and therefore the price of ordinary gas for power purposes must not be pitched very high above that at which the manufacturer can supply the equivalent producer gas on his own account. Without going any further, these are matters which show the useful work lying before a Technical Investigation Committee; but we are not convinced that such a Committee should be appended to any one of the District Associations. We believe in individual investigation, so as to make it as broad as possible; but there is work to be done in the investigation of individual research by a specially qualified Committee. Such investigation would show where there is relation and where there are differences; and, where there were differences, there further inquiry could be made. But such a Committee should be (especially now that the District Associations are affiliated to it) of the Institution of Gas Engineers, if of any body; though a Committee of Reference in connection with each District Association might also be useful. There is a large amount of work done by special Committees in connection with Gas Associations abroad; and their reports form valuable matter for consideration at meetings. Why the practice should not obtain to fuller extent in the gas organizations of this country, we never could understand. As the result of Mr. Copp's paper, the matter has been referred for consideration to the Committee of the Midland Association, and so there will be more heard of it later on.

One other point. To Mr. A. T. Harris, of Market Harborough, it must have been a matter of considerable satisfaction that his paper on the "Reconstruction of Small "Gas-Works" was discussed so fully. It was a paper prepared with the care which runs through the design of the small works that was placed before the members. Mr. Harris believes, and rightly, that the plant by which the manager of a small gas-works has to produce his results should be of the same rank in efficiency as the plant of larger works. He has applied this principle in the works with which he has been associated, with remarkably good financial results. In the construction of a small bench of retorts or the laying down of any other part of a gas-works plant for works of the size that Mr. Harris deals with in his paper and reply to the discussion, the total difference in cost is not so great that that difference cannot be—if it is not, it should be—compensated by the improved results obtained as compared with those realized by even new plant of an inferior order. For small as well as large works, the best (not necessarily the most expensive) is the cheapest in the long run. That is what Mr. Harris proves when his paper and reply to the discussion are read together.

Manchester District Institution—
Commercial and Other Questions.

Close upon the Midland Association meeting, the members of the Manchester Institution held their first meeting for the year; and the proceedings presage much of interest during the presidency of Mr. S. Meunier. Originality enters largely into that gentleman's mental equipment; and he would not have been the author of the address which delighted the members on Saturday had it not contained much fresh thought. It is manifest that Mr. Meunier is something more than a little sceptical as to the commercial administration of many gas undertakings being of the highest order; and, in our putting his case thus bluntly, he need not fear that it will produce for him any unbearable tempest—seeing that his belief is the accepted opinion of many in the gas industry. The commercial management of gas-works is, of course, largely ruled by market fluctuations, and those fluctuations the whole gas industry combined could not stay any more than Canute the advancing waves. But there is no doubt that there is something rather traditional and musty about the methods followed in purchasing and selling by those who direct many of our gas undertakings. They have got into a certain rut. It has served them fairly well; and therefore they do not attempt to do better. To strike out into new lines in these matters in the endeavour to secure more favourable terms, is undreamed of by those administrators who are wrapped up in antiquated notion and contentment. We have only to compare the number of advertisements appearing in our columns, inviting tenders in respect of the sale or purchase of the requirements of gas undertakings, with the number of the gas undertakings of the Kingdom, to give one an idea of how even the cardinal principle of competitive sale and purchase in the case of such large businesses as gas supply is disregarded. Economy in manufacturing methods is widely preached, and daily becoming more widely practised, with the view of selling the principal product as cheaply as possible. But where this is not accompanied by an equally strict regard to purchase in the cheapest markets consistent with good results, and dealing with the residual products to the best advantage, the utmost economy and profit to the undertaking are not secured.

That, in effect, is what may be considered to be the fundamental line of thought on which Mr. Meunier constructed his address, which is full of suggestive matter. He passes in review the principal items on the spending and revenue sides of the working account of the gas supply undertaking,

pointing out where administrative weaknesses can and do frequently come in, where every possible measure should be taken to effect improvement, and on every point he advances suggestion. The President's study of these matters in connection with the Commercial Section of the Manchester Institution serves him well in this consideration of the special subject of the address; but some of his propositions he desires to be regarded merely as such, and not as definitive recommendations—suggestions, in short, well worthy of fuller deliberation. Some of them, we must confess, have such a remoteness of possibility or feasibility about them that we have little hope, however desirable they may be, they will ever find existence among the methods subscribing to the betterment of commercial transaction in the gas industry. For example, take the idea presented by him of the larger gas undertakings (on payment of a nominal fee) constituting themselves coal-testing stations for smaller undertakings, in order that the latter should have greater latitude in the purchase of coals. We can fancy most of the larger undertakings, whose only real profit would be the knowledge obtained of the coal in question (with possibly, in cases, an immediate purchase to the detriment of the small undertaking submitting the sample), would see very good reason for not encumbering themselves with other people's business. Then again, his proposal (around which he himself sees many difficulties) for essaying to avoid extreme fluctuations in the price of coal is, we fancy, something that has reference to the Millennium, and not to the present age. On the questions of salaries and wages, rates and taxes, coke, tar, and especially on the price of gas, Mr. Meunier has much of interest to say, and much that is drawn from experiences in the dealings of the Stockport Corporation Gas Department, though he keeps the name of Stockport in the background as far as is possible. We cannot here touch upon the extensive range of topics composing this address; but we do hope that the President's invitation to take the subject-matter up for discussion at a future meeting will be acted upon. There is more than sufficient in it to occupy a complete sitting without any other technical matter.

From the address and the reports presented at the meeting, it is seen that the scope of the work of the Commercial Sections of the Institution has been considerably enlarged; and it is developing a sphere of usefulness upon which the President looks most hopefully. His remarks on this subject should assist the Committee of the Midland Association in their consideration of Mr. Copp's proposal—perhaps not to the establishment for their own Association of a Technical Investigation Committee, but what Mr. Meiklejohn more suitably described as a Committee of Reference. One possible effect of affiliation with the Institution of Gas Engineers is showing its head. Such sections as those attached to the Manchester Institution and the contemplated Committee of the Midland Association could (we take the suggestion from Mr. Meunier's address) do the rough work of making comparisons and formulating schemes, and, through their District Associations, submit them to the Institution "in such a form "as to give the Council [or a Technical Investigation Com- "mittee of the Institution] the maximum of information "and the minimum of labour, in order to bring it before the "members in a clear, concise manner for their ruling upon "it." Again, there is between the Midland Association meeting and that at Manchester a link in respect of the topic of educational facilities for the junior members of the profession. The Manchester Junior Association have approached the senior District Institution on the matter, and their request (which has not yet been completely formulated) was heartily commended by the President to the favourable consideration of the members.

The question of the testing of street-lamps *in situ* is one that has not been treated upon with that frequency which might have been expected, in view of the importance of the subject in these days of sharp competition for the illumination of public ways and places; and therefore it may be imagined that the gas engineer and manager has not, generally speaking, been sufficiently interested to dive into the subject on his own account, and ascertain what there is to be learnt from the exercise. Mr. Robert Watson, in the only paper presented at this meeting, gave the results of some investigations into the matter which he has been making at Doncaster. The communication is a very able one; and it goes without saying that, being work carried out by Mr. Watson, it is stamped with absolute thoroughness. Perhaps the reason that has caused so little interest to be taken in the subject is that the study in the past has been somewhat tedious and troublesome; but Mr. Watson is sufficiently satisfied that modern photometrical improvements render comparatively simple the work of comparing illuminating effect. We are glad that in this paper the author has distinguished between illuminating effect and illuminating power; because it must be urged that, with so many contributing or deteriorating circumstances attributable to location, it is very unfair to attach to any lamps, as has so frequently been done, certain illuminating powers which are, under the conditions of testing, unjust and possibly very detrimental to the particular form of lamp. Mr. Watson states the minimum illumination effects between the lamps tested (the conditions all being described), which effects he finds sufficient and satisfactory; and besides he offers, as the result of his study, certain suggestions, with the view of obtaining a more equable distribution of the light from street-lamps. We will not, however, detract from the interest of the paper by indicating here its contents. The paper was one after Mr. Thomas Newbigging's own heart; and the members had once more the gratification they always derive from his presence at their meeting. He was the principal contributor to the discussion on the paper. There were several matters of a general nature considered by the members, among them that of the question-box, into which system of technical inquiry the members have determined to enter on their own account.

America and the Proposed Institution of Gas-Works Contractors and Manufacturers.

Two journals identified with the gas industry of the United States have done us the honour of commenting upon the suggestion set forth in the article of Dec. 6, and which was crystallized in the heading, "An Institution of Gas-Works "Contractors and Manufacturers." The one applauds; the other condemns. But for the moment, it may be said, that the one condemning does so under a total misapprehension of things bearing upon this particular matter as they exist here; and therefore, friendly though the criticism is, its point is absolutely destroyed, so far as this country is concerned, by the *pseudo*-hypothesis underlying the argument. Our American contemporaries who have given consideration to the question are "Light" and "Progressive Age."

Coincidence of thought and evolution of ideas are not an uncommon thing in these busy times, when men's minds are ever active in the endeavour to be participants in the great struggle which has no finality, but which has its successful issues in Progress. The coincidences are frequently most singular; and we have here one of this type. It is curious that, while the idea was being revolved before giving publicity to the suggestion as to the formation of a Gas-Works Contractors and Manufacturers' Institution in this country, simultaneously our contemporary "Light" was working to the same end in America, and, just before receiving the issue of the "JOURNAL" for Dec. 6, they had published their proposal. The conception of the idea and the similarity of the proposals occurring at about the same time, and in places so distant as New York and London, induced the Editor of "Light," in his January issue, to quote extensively from our article, and to heartily commend what we had said to the consideration of his readers in support of his own advocacy of a somewhat identical organization in America. The honour and the encomiums are highly appreciated; and the efforts of our contemporary have our best wishes for success.

The scheme of our American contemporary, however, goes a step farther in one direction than the plan that we had in mind. But the step is one which marks, to an extent, a difference in the policy of gas management in the two countries. The proposal of "Light" is a Commercial Gas Association, composed of the commercial men of gas companies and the manufacturers of gas appliances. In this country, excepting in comparatively few instances, the commercial section of a gas company's business is completely in the charge of the gas engineer and manager; and the gas engineer and manager is provided for in his national and district organizations, which are specially constituted to meet his requirements and his only. Consequently, in those organizations the important section—the other half—of the gas industry which produces the gas plant and appliances, and furnishes the material necessary to the work of the

gas engineer and manager, has no stand or part; and it is with the view of giving those (chiefly principals, directors, and managers of these firms) constituting that section opportunities for conference and for co-operation with the associated bodies of the gas-engineering profession that the founding of an independent Institution of their own is proposed. One of the first acts which "Light" proposes for the Commercial Association is the organization of a gas exhibition in America "such as would challenge the attention of the world." The great success of the Earl's Court Gas Exhibition, from the points of view of both plant and appliance manufacturers and gas suppliers, should be a precedent, convincing and encouraging, for our American friends. We have no doubt, in view of such recent experience as has been obtained on this side, that the exhibition project is one which should be developed, and one which would be a worthy and brilliant send-off for any American Commercial Gas Association. It would undoubtedly bring them such *kudos* as would, in the highest degree, accredit their subsequent proceedings in the eyes of the whole gas industry. Throughout the argument of our contemporary in support of the organization, runs the idea of the broadest sympathy and cultivation of mutual means and work between one section of the gas industry and the other, through their respective organizations. That is an indispensable condition if anything of substantial value to the whole industry is to be accomplished by any new organization in gas territory hitherto unoccupied.

Now we have to turn to our other named contemporary, "Progressive Age," who cannot, it is regrettable to see, understand anything about this matter, excepting that such organizations as are offered for consideration would have for their motto "Aggression," and that protection and self-interest would dominate their proceedings. The estimate of the men who it is proposed shall constitute the membership of these organizations is a poor one. This is a "progressive age;" and yet the Editor of a paper using those significant words for the title of his publication is bold enough to tell the gas-works contractors and manufacturers that they are not to be trusted with an organization of their own, run on the same lines as other gas associations, and with, in their own spheres of plant and appliance manufacture, identical purposes, because, in the narrowness of his conception of usefulness on their part, it would only end in something or other inimical to the gas industry. Why should contractors and manufacturers not be capable of contributing to the general benefit of the gas industry through their organization equally with those constituted by the gas-engineering profession? Probably the Editor of "Progressive Age" will find it more difficult to reply to this question than to present a statement as to why they should be capable. He builds his criticism, so far as it applies to the "JOURNAL," upon the sands; and he must admit, when he is enlightened that that is a most dangerous proceeding. He assumes (his statement may apply to America, but not to this country) that "there is a place in all our Gas Associations for the "commercial men, and they have equal privileges with gas "engineers in reading papers or in discussion." In this is found the instability of his whole argument. The gas contractor and manufacturer in this country has not a place in the national organization of the gas-engineering profession; and in the smaller District Associations he only occupies—the primary purposes of the Associations being identified with the work and management of gas undertakings—a secondary position. The opportunities of the suppliers of the requirements of gas-works in contributing in any way to the work and general good of the industry is completely limited to what can be done through their individual works and businesses; and, while their intentions and willingness may be good, what they can do individually is further circumscribed by the thought that what is done will only be credited by some to self-interest, to self-aggrandisement, or to self-advertisement. This would be found to be the case; and it would exercise a restraining influence, if they were members of the existing gas-engineering organizations. There is strength in unity; and that strength can be used for good as well as for ill. Where an individual cannot move, an association of which he is a unit can often go, and, when working on a plan of definite usefulness, can command respect. British gas contractors and manufacturers have no such organization, and no part in one representative of them as an important labour and capital employing section of the industry, with men of skill and technical training in their various divisions. In their ranks they have much talent and technical and specialized business ability, which are, as it were, in present circumstances, hidden "under a bushel." Our proposed organization aims at something higher than a mere protection society. It is an Institution with technical and social aims, and conducted on the same high grade as existing gas organizations, for those who produce the necessities at one end for manufacturing gas and those who produce the necessities at the other end for consuming it. It is only the section that lies between these two extremes, but which binds the two extremes together, that is provided with means and opportunities for beneficial intercourse both to themselves and to the industry of which they form part.

Perhaps in the light of this explanation, the Editor of "Progressive Age" will see that he has been unprofitably, so far as we are concerned, spending his time in chasing a shadow, and that there is something more substantial in the project which we have in view. Over in this land, we look upon the present as a progressive age in which the association of men is possible without regarding it with suspicion, or besmirching it with such sullied terms as "protection," "aggression," or a few others which are to be found in our cousin's business vocabulary.

Low Salaries and Reprehensible Practices.

There are few gas engineers and managers in the country who will not invoke a blessing on the head of Mr. W. A. Valon for the service he has done the profession in calling the attention of the Directors and shareholders of the Isle of Thanet Gas Company, at their annual meeting (see p. 591), to what he describes as "the totally inadequate sum" offered by the Board as remuneration to Mr. James Dougall's successor in the engineership—a sum altogether incompatible with the position the successor is asked to occupy, and the services he will be called upon to render to the Company. Such practice is false economy. It deters many men of the highest qualifications from applying for the vacancy; and it affords them some measure of the future consideration in the way of reward that they are likely to receive at the hands of the Directors. It is all very well for Directors to say that they intend to increase the stipend of the Engineer as they think needful. That is a bit too nebulous for most men who have talent and ability to devote to the service of a gas undertaking; and when Directors think that a low salary is all that is needful to tempt to their service such men, those men in their turn may be pardoned for putting a low value on what those same Directors may consider needful in the way of advance in the future. But there is another aspect of the question, which was so well put by Mr. Valon that we cannot do better than fully quote his remarks on it. He observed: "Much had been said lately in the leading technical journal about commissions and bribery; and a strong stand had been made against what were accepted generally as reprehensible practices of that kind. If they would allow him to say so, he considered it was equally reprehensible on the part of companies not paying a sufficient wage to their officers to remove from them the temptation they were otherwise under to increase their incomes by illegitimate means." The acceptance by gas engineers who are qualified for high positions of offices carrying insufficient remuneration, is not the way to secure and maintain a high standing for the profession. We have in the profession strong advocates for opportunities for higher cultivation of the younger men of the profession, and men in high place who have occupied the presidential chair of the Institutions old and new have urged adequate remuneration in order to make the profession an attractive and encouraging one. But still there are Directors and Committeemen who refuse to recognize that responsibility and skill deserve proper reward. They should remember that their money and the money of the shareholders is largely in the hands of their Engineer and Manager. Mr. Valon has taken a fair opportunity in the case of an undertaking occupying an important place in the industry for calling attention to this matter; and perhaps of his lead advantage will be taken to bring the matter prominently to the notice of other Directors and Committeemen who estimate the value of the services of their engineers and managers at a low rate. It is not the first time that Mr. Valon has concerned himself in the interests of gas engineers and managers. We recollect that some

years since he took a not unimportant part in securing provision for the proper compensation of officials on the transfer of gas undertakings.

A Reminder of the "Stop—Not Slot" Articles.

The articles which were published some time since, giving the results of an examination into the experiences of the Croydon Gas Company with stop and slot meters, which experiences came out well in favour of the stop meters, are brought to mind by statements made at the recent meetings of the Brentford and Croydon Gas Companies. In the case of the former Company, they have in use both penny-in-the-slot meters and shilling-in-the-slot meters. In the case of the latter, a rent is charged; and the supply of gas for the 1s. is regulated to the current ordinary price. The Chairman (Mr. Howard Charles Ward) stated, in effect, in his address at the meeting of the shareholders, that in the case of the slot meters in which there was added to the price of gas a sum to cover the use of fittings, &c., a distinct diminution in the quantity of gas consumed was noticed; while in the case of those meters which were set to supply gas at the price to ordinary consumers, there was a marked increase of consumption. This is interesting in conjunction with the experience of the Croydon Gas Company, that in the Carshalton district the rate of consumption under the stop-meter system has been greater than a year ago under the slot-meter system. It is, of course, true that, in the case of the Brentford Company, the financial circumstances of the two classes of consumers may not be the same relatively to last year; and it is also true, in the Croydon Company's case, that there has been a reduction in the price of gas in the Carshalton district, equal on the half year to about 4d. per 1000 cubic feet. As against this last fact, however, it is the case that there has been among the working population in the Carshalton district very great financial depression lately. Commenting on the similarity of the experiences of the two Companies, Mr. W. W. Topley, the Secretary of the Croydon Company, says they seem "to indicate that the system by which gas is charged at the lowest possible price, tends to an increase of consumption, as compared with the system in which, whatever quantity of gas be used, it has added to it a fixed amount for the use of accessories."

German Cement at Swansea.

A good deal of attention, in one way and another, is now being devoted to the doings of local governing bodies throughout the country; and as time goes on, this is likely to increase rather than diminish. This is only natural; for inasmuch as the money required is not procured solely—nor even, generally speaking, mainly—from local sources, the interest in municipal affairs is not purely a local one. It is from this wider point of view that the "Financial Times" has been busying itself with the investigation of a strange proceeding by the Swansea Town Council. Indeed, the tale unfolded as the result of these inquiries is so opposed to the most elementary business principles that one would be inclined to think there must be a mistake in it, had it received publicity in a less well-known quarter. The transaction in question occurred in connection with the troublesome Cray Water Scheme; and, briefly, the story told by our contemporary is this. Some two years ago, when the works were taken over by the Corporation, tenders were invited for large quantities of cement, and later, owing to a mistake made by one of the offerers, fresh tenders were asked for, instead of the next lowest (by well-known British makers) being accepted. Profiting by the publication of the original figures, some German manufacturers on the second occasion quoted a low price, and were awarded a contract for a minimum of 5000 tons at 33s. 6d. per ton; the Corporation having the option of taking 18,000 tons at this price, if desired. The minimum quantity having been exceeded, and the cost of production in this country having fallen, a leading firm of British makers recently offered to supply the balance required at 30s. per ton. The Committee thereupon decided to invite the Germans to revise their price; and it is alleged they actually disclosed to them the terms of the British offer. Anyhow, the Germans, after contending that the Corporation were bound to them for the entire quantity of cement required, ultimately expressed their willingness to reduce their rate to 31s. 6d., to which the Committee replied by an offer of 31s. per ton—or 1s. more than the price at which they could have procured it in this country. It is asserted that the negotiations have been kept so quiet that even now the ratepayers do not know what has been decided upon. "Apparently," says our contemporary, "the wave of revivalism has developed in the minds of the Swansea town councillors a spirit of charity to the foreigner which may be very estimable in its way, but is neither patriotic nor businesslike." Cement making is an important industry in this country; but it cannot be expected to thrive if the example of Swansea is followed to any extent.

The Decimal Association.

There is a cheerful ring about the recently issued report of the Executive Committee of the Decimal Association for the past year, in spite of the fact that the heavy expenses incurred have left them with a considerable debit balance. This shortage can easily be understood when it is pointed out that the total receipts for 1904 amounted to only £1544, which (though it compares favourably with the £768 collected during the previous twelve months) does not appear to be at all adequate to finance such a campaign as the Association are carrying on. However, the progress made since the last report towards the adoption of the metric system of weights and measures is regarded as most satisfactory. A Bill to render the change compulsory has been read three times in the House of Lords; and over 330 Members of Parliament promise their votes when (if ever) the measure reaches the Commons. Under these encouraging circumstances, every effort will be made to carry the Bill through the Lower House during the present session. The Association, however, are not by any means to be left to wage the conflict unassisted; for, in addition to the petitions presented from Trade Unions to the House of Lords, the Parliamentary Committee of the Trades Union Congress have requested the Home Secretary to receive a deputation to express their views on the need for the reform. The Governors of the Crown and of the self-governing Colonies, too, have, in reply to an inquiry by the Colonial Secretary, expressed almost unanimous approval of the metric system. The Society of Accountants and Auditors, the General Medical Council, the Silk Association of Great Britain and Ireland, and the Association of Trades Protection Societies of the United Kingdom are among the other bodies who have interested themselves in favour of the reform; and the Association now claim that the movement has the support of a large majority of the most eminent men and leading firms in the country.

An Explanation.—With reference to the final paragraph in the editorial in last week's "JOURNAL" dealing with the Commercial Gas Company's affairs, attention has been called to the fact that any rumour there may have been as to relationship existing between Mr. Thomas Bevan and Mr. Roland Yorke Bevan is totally unfounded. That rumour, however, did not comprise the only ground for the paragraph. A proposal (other than the election of Mr. Bevan) which it was anticipated would—but did not—come before the meeting of proprietors to be voted upon, but may do so on another occasion, raised in the minds of certain interested people a question of propriety.

The Late Alderman Stones.—At the last monthly meeting of the Smethwick Town Council, references were made to the death of Alderman J. Stones, the Chairman of the Gas Committee, which was announced in the "JOURNAL" last week. The Mayor (Alderman G. Bowden) moved a resolution expressing the Council's high appreciation of the excellent and disinterested services the deceased Alderman had rendered to the town, and sympathizing with his relatives in the great loss they had sustained. The resolution was passed in silence, the whole of the members standing. On Wednesday, the interment took place in the family vault at St. Matthew's Church, Smethwick; the Mayor and a large number of the Town Council and the Corporation officials attending.

A French Vertical Gas-Purifier.—A patent has been taken out by the Société Anonyme des Ateliers de Montreuil for a gas-purifier arranged vertically instead of horizontally, each section consisting essentially of a gas-tight vertical chamber divided longitudinally into three compartments by means of two upright partitions constructed of louvres. The middle compartment is filled with the purifying material; the louvres serving to keep it in position while permitting the free passage of the gas from one of the outer compartments, through the purifying material, into the other. The spent purifying material is discharged when necessary by withdrawing a plug at the bottom of the chamber. Horizontal baffle-plates in the outer compartments cause the gas on entering to be distributed over the whole surface of the screen of purifying material. The sections are grouped together in any desired manner. Charging takes place from a staging above.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 593.)

THE Stock Exchange has had another good week, although the volume of fresh business was necessarily handicapped by the attention devoted to the fortnightly settlement, an operation which does not appear to have involved difficulties. The general tone was excellent, and the demand for high-class securities continued as strong as ever. There was, of course, an amount of realization to secure profits; and this came on Thursday instead of the usual Friday—the birds being early to pick up the worm. However, the upward movement was at once renewed after their desires had been satisfied. The elevating factors were cheap money and a feeling that Peace is in the air, although we cannot yet hear the beating of her wings. In the Money Market, there was a good demand for the Stock Exchange and other requirements; but the position is really easy, and again the maintenance of the Bank of England rate gave rise to complaints in certain quarters. Business in the Gas Market was on a fair scale. The leading issue perhaps was not quite so brisk, but *per contra* some others were more so. The general tendency was favourable; there being a good inquiry, although here and there the *ex div.* changes work out an apparent fractional reduction. In Gaslight and Coke, the ordinary was steady at the prices of the previous week, transactions ranging from 99⅝ to 100¼. Moderate business was done in the secured issues. The maximum marked 92¼ to 92½; the preference advanced two points, and was done at from 112 to 113½; and the debenture changed hands at 90½. South Metropolitan was more active at about the same figures as in the week before, dealings ranging from 127⅝ to 128½, and ditto debenture was done at 89¼ and 91. Commercial 4 per cent. marked 116⅞ *ex div.*, and the 3½ per cent. was done at 113½ *cum div.* and 112 *ex div.* There was rather more animation among the Suburban and Provincial group, coupled with general steadiness. Brentford preference marked 134, and Brighton ordinary 171. British was done at 41¼ and 41½, and Bournemouth "B" at 16¾. North Middlesex new changed hands at 14, and South Suburban ordinary at 125½. Tottenham and Edmonton was more noticed. The "A" marked 127, the "B" changed hands several times at 102, and the debenture advanced a couple of points. West Ham preference also advanced, and was done at 126½ and 127½. The Continental Companies continued quiet. Imperial gained a point, marking from 211½ to 214, and the debenture was done at 97 and 97½. Union changed hands at 118¼ and 119½, and European fully-paid at 22. Tuscan advanced and marked 9¼ and 9½. Among the remoter undertakings, Bombay was done at 6⅝, and ditto part-paid at 4¾. Oriental was done a special bargain at 150. Buenos Ayres marked from 11⅞ to 12⅛, and ditto debenture 96. River Plate was done at 12⅝. Primitiva changed hands at from 5⅝ to 5 13/16, ditto preference at 4 13/16 and 4⅞, and ditto debenture at 95½ and 95¾. San Paulo was done at 12⅜ and 12 7/16. South African was marked at 16.

The closing prices are shown in our Stock and Share list at page 593.

DIRECTORS OF COMPANIES AND THEIR FEES.

THE attention of all concerned may be directed to the judgment given last Tuesday, in the King's Bench Division of the High Court of Justice in the case of *Young v. Naval and Military and Civil Service Co-Operative Society of South Africa, Limited*, which raised the question whether a director of a company, who received a fixed remuneration for his services as such, was entitled to be paid in addition the travelling expenses incurred in attending the board meetings. The plaintiff, it appears, was appointed a Director of the defendant Company in April, 1902, while he was residing in the West of England; and he continued to reside there while holding the directorship. During the month succeeding his appointment—namely, in May, 1902—the following resolution was passed at a Board meeting at which he and four other Directors were present: "That all reasonable travelling expenses be reimbursed to the Directors from time to time." The Articles of Association provided for the payment of £200 a year to each Director "by way of remuneration for his services," and also for special remuneration for those rendering special services or making special exertions, in going abroad or otherwise for the purposes of the Company. For each occasion on which the plaintiff attended a meeting of the Board he was paid out of the Company's funds his travelling expenses to and from London, and his hotel expenses while in London—nineteen receipts bearing his signature being produced at the trial. The present action was brought by him to recover a balance of fees (as to which there was no question), and a small sum for unpaid travelling expenses. The Company put in a counter-claim for all the travelling expenses paid to the plaintiff, and also for similar payments made to certain other Directors, to which he was alleged to be a party.

In delivering his judgment, Mr. Justice Farwell said: "I am told that it is not unusual for directors to receive their travelling expenses to and from board meetings out of the company's assets; and I was unwilling to charge the plaintiff in this case, who was obviously honest, and whose whole salary as a director will not cover his travelling expenses, if I could avoid it. But, in my opinion, the law on the subject is plain." "Directors"—quoting from a previous decision—"have no right to be paid for their services, and cannot pay themselves or each other, or make presents to themselves, out of the company's assets, unless authorized so to do by the instrument which regulates the company, or by the shareholders at a properly convened meeting." Directors, however, being both agents of, and trustees for, the company, are entitled to be indemnified by the company against all losses and expenses properly sustained and incurred by them in the due performance of their office. Their right to indemnity arises by the implication of a contract from the relation between themselves and the company; different contracts being implied from different relations. Thus an unpaid trustee is entitled to complete indemnity for all proper expenses incurred by him in the execution of his trust. Different considerations, however, apply to the case of a paid agent or trustee; the question then being: What outlay does his remuneration cover? It is the chief part of the ordinary business of a director to attend board meetings, and he is paid a fixed sum for attending and advising with his co-directors. He lives where he pleases, and suits his own convenience. He cannot perform his obligations without attending the board meetings; moreover, the banker or merchant who employs managers or clerks to work for salaries does not thereby incur liability to reimburse them their travelling expenses to and from the offices. The resolution of May, 1902, was equivalent to voting the Directors of this Company a present or additional remuneration to themselves, and was therefore bad. Judgment was accordingly given in favour of the counter-claim of the Company, except in respect of certain payments to other Directors of which the plaintiff had no other than a general knowledge. The latter was, however, held to be liable for a payment of £10 to one Director, for which he signed the cheque.

These are the outlines of a judgment which is a very clear exposition of the law on the subject, and from which it is evident that a director has no more right to be paid his travelling expenses to and from the board-room (unless expressly provided for by the terms of his appointment by the shareholders) than shareholders have a right to payment of income-tax in addition to maximum dividends; and those who unintentionally err in this respect would do well to put themselves in order.

Of the Parsons steam-turbines, the number in use gives about 1,000,000-horse power; of the Laval turbines, about 3500, with a total of 100,000-horse power; of the Curtis, about 300,000-horse power; of the Rateau, 15,000-horse power; and of the Zoelly, 20,000-horse power.

Mr. James Atkins, of Ellerslie, Abbey Road, Malvern, a Director of the Richmond Gas Stove and Meter Company, Limited, who died on the 29th of December last, at Cromwell Road, Hove, aged 85 years, left estate of the gross value of £112,403, with net personalty to the amount of £100,911.

The returns relating to the gas undertakings of the United Kingdom—companies and corporations—which were noticed in the "JOURNAL" last week, show that acetylene has not made much progress as an illuminant. In the year 1898-9, it was supplied at Portsoy, in Banffshire, to the extent of 82,500 cubic feet; it dropped to 75,239 cubic feet in 1899-1900; it afterwards rose to 81,402 and 89,355 cubic feet respectively in the next two years; in the year 1902-3 it went back to 84,287 cubic feet; and in 1903-4 (the year of the last returns) it rose to 86,600 cubic feet. The price is 6s. per 100 cubic feet.

In the report of the Council of the Institution of Mechanical Engineers, which was presented at the annual meeting on the 17th inst., it was stated that information had been received from Professor F. W. Burstall, that the two specially constructed large gas-engines and a gasholder erected in the new power-house of the Birmingham University are available for the Gas-Engine Research Committee's experiments. A scheme of experiments, indicating the methods of working, is under consideration, and it is hoped that the next report will be ready for presentation at the opening of the ensuing session. A generous gift of £100 towards the expenses of carrying on the research has been received from Dr. Ludwig Mond, F.R.S. The name of Captain H. Riall Sankey has been added to the Committee, of which Dr. A. B. W. Kennedy is Chairman.

Writing in the "Chemiker Zeitung," M. Feret deals with the question of the impermeability of concrete in water. He finds that the permeability of concrete to water varies inversely with the proportion of cement in the mixture and the fineness of the cement particles present. Furthermore, the permeability is reduced to a minimum when the coarse and fine particles are in equal quantity, with a moderate proportion of medium particles. It is also rapidly lowered when salt or fresh water is allowed to circulate freely in the concrete. In some cases it was ascertained that the water penetrating the mass dissolves out lime, which is re-precipitated near the surface, and thus closes up the pores; and on this basis experiments were successfully made in rendering concrete impermeable by treatment with slaked lime. Sodium silicate, soap, and alum are also recommended; but the best method is to plaster the concrete with rich cement mortar.

ELECTRIC LIGHTING MEMORANDA.

The Attraction of London for Promoters—Dividends of Representative London Companies—Unprofitable Supply in Residential and Other Districts—The Menacing London Electricity Bills.

For profitable electricity supply, London is naturally the best of fields; and it is no doubt this proved fact that is attracting the electrical promoter to such an extraordinary degree in and round about the Metropolis. If all who would have a finger in the pie were allowed their desire, the pie would be quickly brought to a parlous condition—in other words, the prosperity of to-day would be but a shadow not many years hence. We cannot think, however, that Parliament, with the recorded experiences before them of the results of competitive gas supply of some years ago in a far less congested London, will now dream of submitting the capital to all the annoyance of practically the same kind of thing in connection with electricity supply, and the Companies to whom they have granted statutory powers to what would be for some of them a serious and perhaps destructive attack. The Charing Cross and Strand Company are at the present time competing in the City for any class of supply, and with what present effect? The answer is, a withdrawal of some of the profits made from the West-end consumers to make up the necessary sum to pay the dividend on the preference capital employed in the City! There is something more than a touch of unfairness about this condition of things which the West-end consumers might well protest against. The mind, too, reverts to the disorganization of the traffic while the Company were executing their plans for invading City territory. May long-suffering London be preserved from anything further of this kind—to say nothing of what the promoters of Bills in the present session of Parliament would bring upon it, if Parliament submitted to their prayers. There must be some regulation in this matter of electricity supply. The ratepayers have got enough of it, and are tired of these concerns and their works causing a dislocation of business such as has never been experienced before; while the existing electricity shareholders will soon be uneasy about their holdings if Parliament does not show some sign that they are prepared to protect what they have already conferred.

But we were speaking of present prosperity being an attraction in London to electrical promoters. And there is a fair amount of prosperity spread over electricity supply through private concerns in the Metropolis. In one or two cases, there is nothing to boast about; but, with these exceptions, the shareholders have now—how long it will last is another matter—every reason to be satisfied. The City of London Company are in a position to pay 6 per cent. for last year, after placing £45,500 to reserve—the distribution being 1 per cent. more than in the previous three years. At the same time, competition in the City is going on severely. The Charing Cross Company are there pushing forward their lamp connections, and last year saw their gross revenue carried up to £78,431. But the profit of £15,670 was not sufficient to pay the 4½ per cent. preference dividend; and, therefore, as previously stated, the profits made from West-end consumers have had to be drawn upon. On the West-end business, the Company are able to pay a dividend of 8 per cent. on the ordinary shares, and to carry forward £10,223. The London Electric Supply Corporation have brought passing fame upon themselves by succeeding on the past year's working in paying the ordinary shareholders a 3 per cent. dividend. The concern has had a large but temporary accession of business through a terminable contract with the London County Council, which will probably see its end in a year or so, if a generating-station for tramway purposes that the Council have in hand is then completed. After not being for some years in a position to pay a dividend at all, the Board of the Company show their efficiency and cuteness as directors by saying as little as possible as to their indebtedness to this contingent piece of business for helping them to raise the spirits of their shareholders. The St. James and Pall Mall Company are glorying for the eighth consecutive year in a 14½ per cent. dividend; but they have one of the choicest districts for electricity supply. The Company made a reduction in price during the year, and are feeling the benefit of it. The Westminster Company are in similar case, with a district wealthy in its opportunities for electrical business; and the shareholders enjoy their 14 per cent. dividend. The Directors are, however, going, for the time being, to divert any additional profits to the development of business by reducing the rates of charge. This is sound policy; and perhaps the Directors have lately had greater occasion to recognize it. These two last-named Companies have between them a power-generating concern known as the Central Electric Company; and it is paying a dividend of 5 per cent. The Chelsea Company do not appear to be developing by "leaps and bounds;" and the more modest but still comfortable dividend of 6 per cent. is what they are declaring. The Kensington and Knightsbridge Company are doubling Chelsea in their payment—the dividend amounting to 10 per cent., supplemented by a bonus of 2 per cent. Taking the Companies all round, the accession of business appears to have been good; but they all favour the practice of stating their development in terms of the 8-candle power lamp, which is no earthly use for the purpose of indicating the extent of prospective consumption. But big figures of this kind look fine in print—more so than the simple statement that so many new gas service-pipes have been put in, each one of which may be the channel of communication with the equivalent of several hundred 8-candle power incandescent gas-lights, to say nothing of fires and cooking-stoves. It is the West-end Electricity Companies who are prosperous above all others; and yet the Gaslight and Coke Company are adding to their increases—having now escaped from the trammelling effects of serious electricity competition even in an area where the electrical system of lighting could not fail to appeal to the fancy, and having also in large measure seen (during the same period) the worst of the consumption economizing propensity of the incandescent gas-burner.

From the dividends of the London Companies, it is seen that, in the natural order of things, the choicest districts yield the fattest returns to shareholders on their investment. But there is Chelsea, which is a district that, in respect of density of property, will not be equalled in the provinces, excepting in the great centres of industry and commerce; but there the Company only pay a 6 per cent. dividend. If nothing better than this can be done in Chelsea, what chance of success have many of the authorities of little towns who have already committed themselves to, or who are itching for, an electric-lighting installation of their own? The "Municipal Journal" has recently been paying some attention to certain of the dismal financial failures in electric lighting; and it is thought by that paper—though its policy is of the red-hot pro-municipalistic order—that, at any rate, the residential districts lying beyond the boundaries of Greater London do not present such a field for electrical enterprise as would justify the anticipation of large profits or low costs. We are glad to find that occasionally we can rank ourselves with our Municipal contemporary. Epsom is given as an example; and while it does not occasion any surprise to the writer of the article before us that there was a deficiency in the annual accounts, it does appear to him that the amount which had to be provided from the rates in the last financial year was greater than seems to be justified. The deficiency on the year's working was £1497. The rates charged were 6½d. and 3d.; but only £11 worth of energy was sold at the lower price! Prepayment meters were in use; but—whisper it not abroad—the sales through this source only realized £3! Beckenham, again, shows a loss of £1585. There was a deficiency there the previous year of £696; and then, although the business was not paying, there came extensions. The £1585 is the result. Going farther afield, Stafford is shown to have incurred a deficiency of £931 on their last financial year's working; and the accounts are recommended to the perusal of those "who disbelieve in the keenness of the competition between gas and electricity." During the past three years, the quantity of electricity has gradually decreased; this being attributable to the sales by contract having dwindled until this item has disappeared. These are only examples, and not by any means the worst, of the sixty to seventy cases in which local authorities fail to induce the income to complete the circuit of the working and other charges which fall upon their undertakings. Because big dividends are made by certain favoured Companies in London, the Little Pedlingtons of the country must not expect that they can be equally financially successful.

The statement in the opening paragraph as to the London Electricity Supply Bills in Parliament constituting a serious menace to all the existing Metropolitan electricity supply undertakings of London is confirmed by the report presented to the County Council last Tuesday by their Parliamentary Committee. The County Council are, of course, largely interested in the question not only from the fact that they are themselves a local authority under the Electric Lighting Acts for parts of London, but also for the reason that the Council have advanced the greater portion of the money which has been expended by the Metropolitan Borough Councils in the installation of electric lighting undertakings within their areas. Incidentally it may be mentioned that the Borough Councils have invested £5,500,000 and the Companies £11,000,000 in the establishment of undertakings for the supply of electricity in 29 areas. The County Council are fully persuaded that the magnitude of the new proposals, the overlapping powers sought, and the general reversal of the conditions now applying to London, are sufficient grounds for them opposing the Bills. It is obvious that a supply of electricity for power purposes, and also for the lighting of premises supplied with power, would leave in the hands of the existing authorities only the residue of the custom. It may be remarked in passing that Marylebone will not want anything to interfere with any portion of their business, seeing that it is estimated that there will be a deficit balance on revenue account to March 31 of £6050, and an additional £6000 to Sept. 30. The £12,050 it is proposed to place to a suspense account; which it is hopefully expected the Council will be able to pay out of what are—whether humorously or otherwise, we cannot say—called "future profits." But after three years, it will be remembered, the Council have to consider how to make both ends meet "so far as is reasonably practicable."

His Majesty the King has been pleased to accept a copy of the lectures on "British Progress in Municipal Engineering," by Mr. W. H. Maxwell, Assoc.M.Inst.C.E., the Borough and Water-Works Engineer of Tunbridge Wells, of which a notice was given in the "Journal" for the 7th inst. These lectures, as already indicated, are being read before technical societies and chambers of commerce in all parts of the world.

PERSONAL.

At the meeting of the Gas Committee of the Smethwick Town Council last Friday, Alderman C. W. PINKNEY was elected Chairman, in succession to the late Alderman Stones.

The Directors of the Farnworth and Kearsley Gas Company have permanently appointed Mr. HARRY PICKFORD as Manager of the works, in succession to the late Mr. T. L. Sheppard, whose death was announced in the "JOURNAL" for the 14th inst.

Mr. L. J. BLACKBURN, Assistant to Mr. S. O. Stephenson, of Tipton, has obtained the appointment of Manager of the Kowloon station of the Hong Kong and China Gas Company, for which applications were invited in the "JOURNAL" for the 20th of December. Mr. Blackburn was educated at Mill Hill School, and was a pupil of Mr. Stephenson before becoming his Assistant about two years ago.

The esteem in which Mr. JAMES LOWE is held in Weymouth, where, as our readers are aware, he for many years held the position of Manager and Secretary of the Gas Company, was recently testified at a pleasant social gathering which took place at the Royal Hotel, when he was the recipient of a handsome case of pipes, presented by the Mayor (Alderman T. J. Templeman) and a few personal friends. Another presentation was made a few days later by Mr. Lowe's Masonic Brethren in "All Souls" Lodge, Weymouth. The gift consisted of a massive silver inkstand (12 in. by 7 in.) and a pair of silver candlesticks (12 inches high) of Corinthian design, subscribed for by all the members of the various Masonic degrees meeting at the Lodge, as a mark of brotherly regard, on his severing his connection with them to take up his abode at Plymouth. The inkstand bore an appropriate inscription, and also the crest of the Lodge.

OBITUARY.

MR. EDWARD BAKER.

WE regret to record the death, on Monday last week, at his residence, "Stoneleigh," Eastern Avenue, Reading, of Mr. EDWARD EDMUND BAKER, who was for many years Engineer and Manager of the Reading Gas Company. He had been seriously ill for some time, and for several months had been confined to his bed. He lost consciousness about a fortnight ago, and remained in this condition till he passed peacefully away, in his 68th year. Mr. Baker obtained his appointment with the Company in the year 1865, and served them with conspicuous zeal and ability for the long period of 35 years, when he retired from active work owing to ill-health. With the view of retaining his interest in the work, the Directors conferred on him the position of Consulting Engineer. He had previously been Assistant-Manager at the Bath Gas-Works—by a curious coincidence, under the father of Mr. Douglas H. Helps, the present Engineer and Manager of the Reading Company. During his tenure of office, Mr. Baker designed and superintended the construction of the important new works of the Company which were completed in 1881, and were generally acknowledged to be among the best-planned works in the kingdom. They were visited by the Institution of Gas Engineers in 1894, and by the Southern District Association last summer, on both of which occasions they received high commendation from his professional colleagues. Needless to say that Mr. Baker was highly esteemed by the Directors, who at their meeting last Tuesday passed a vote of condolence with the members of the family. Mr. Baker joined the British Association of Gas Managers in 1868, but left it on the formation of the Institution in 1888. The funeral took place at St. Peter's Church, Earley, on Friday; and among the large number present were Mr. Hugh Hawkins and Mr. John Egginton (Directors of the Company), Mr. Douglas Helps (Engineer), Mr. A. Canning Williams (Secretary), Mr. Jacobs (Assistant-Secretary), Mr. Elliott (Chief Clerk, in the Manager's Department), and many other officials, as well as a large number of workmen and pensioners who served under Mr. Baker.

Our readers are aware that, owing to ill-health, the EARL of MORLEY was unable to discharge his duties as Chairman of Committees of the House of Lords last session, and its continuance necessitated the relinquishment of the office and the appointment of the Earl of Onslow on the recent opening of Parliament. We regret to announce that his Lordship died at his Devonshire seat at Plympton last Sunday morning, in his 62nd year. As Lord Chairman, Earl Morley succeeded the late Lord Redesdale in 1889; and in referring to his work in this capacity, "The Times" yesterday said: "In theory, the authorities of the two Houses have co-ordinate control over Private Bill legislation. But the Chairman of Ways and Means of the House of Commons is fully occupied with his duties as Chairman of Committee of the Whole House; and for more than a generation past the Lord Chairman has in fact exercised a vastly preponderating influence. To him and to his standing Counsel—for many years Sir Joseph Warner, more lately Mr. Albert Gray—and in particular to the 'Model Bill' revised year by year under their supervision, is due whatever measure of symmetry, uniformity, and orderly development English Private Bill legislation can show."

A COMPARISON OF THE CALORIFIC POWER OF COAL GAS AND MIXED COAL AND CARBURETTED WATER GASES.

By W. C. YOUNG, F.I.C., F.C.S.

FOR some years past I have been engaged in making frequent testings of calorific power of both coal gas and of mixed coal and carburetted water gas; and as the subject is of some interest just now, I have decided to publish the results obtained during the year 1904. The calorimeter employed in the testings was the Simmance-Abady in every case. The coal gas was of nominal 16-candle quality, and the mixed coal and carburetted water gas of nominal 14-candle quality. The proportion of carburetted water gas in the mixed gas was about 25 per cent. The illuminating power of the coal gas was obtained upon a Harcourt's table photometer; the standard of light being the Harcourt 10-candle pentane lamp, and the test burner the "London" argand, with a $1\frac{7}{8}$-inch chimney. The illuminating power of the mixed gas was taken on a 100 inch Sugg-Evans close photometer; the standard of light being sperm candles, and the test burner the 15-hole argand with a 7 inch by 2 inch chimney, known as the "Brentford." As the "Brentford" burner gives a higher result for this class of gas than the "London" argand, I have made a very large number of comparative testings with the two burners, and find that the average difference is about 1 candle in favour of the "Brentford."

In order to make the results fairly comparable, I have deducted 1 candle from each of the monthly averages in the case of the mixed gas. As the results obtained by candles are so variable, an average of three consecutive testings was taken as the illuminating power of the mixed gas on every occasion, and three or four daily testings were made each week. In the case of the coal gas, the testings were made daily—generally once, but often two or three times; an average being taken when more than one test was made. The averages for each month, with the exception of September, when no testing of calorific power was made, are stated in the following tables:

TABLE A.—*Coal Gas. Average Results.*

Date. 1904.	Illuminating Power.	Calorific Power. B.T.U. Gross.	B.T.U. Gross per Candle.
Jan.	16·5	671·8	40·7
Feb.	16·0	661·9	41·4
March	16·1	672·4	41·7
April	16·2	645·3	39·8
May	16·5	653·1	39·6
June	16·8	656·4	39·0
July	16·5	635·8	38·5
Aug.	16·6	632 7	38·1
Oct.	16·9	655·7	38·8
Nov.	16·7	661 8	39·6
Dec.	16·2	665·8	41·1
Grand average	16·4	655·7	40·0

TABLE B.—*Mixed Coal and Carburetted Water Gases. Average Results.*

Date. 1904.	Illuminating Power.	Calorific Power. B.T.U. Gross.	B.T.U. Gross per Candle.
Jan.	15·1	564·9	37·4
Feb.	15·1	571·8	37·8
March	15·7	582·2	37·1
April	16·4	600·0	36·1
May	16·6	589·1	35·4
June	16·6	598·0	36·0
July	16·4	593·0	36 1
Aug.	16·5	610·4	37·0
Oct.	16·5	620 3	37·6
Nov.	16·1	607·5	37·7
Dec.	16·1	614·3	38·1
Grand average	16·1	595·6	37·0

It will be seen that the average illuminating power for the year was practically the same in each case, and that the average gross calorific power of the coal gas was 655·7 B.T.U., and of the mixed gas 595·6 B.T.U., or 9·2 per cent. in favour of the coal gas. These are gross results; and in order to reduce them to net, I have made more than 100 determinations (using at least 1 cubic foot of gas in each) of the amount of condensed water produced. I find that, on an average, a deduction of 10 per cent. is necessary in the case of coal gas and of 8 per cent. in the case of the mixed gas. The net average results for the year therefore are 590·1 B.T.U. for coal gas and 548 B.T.U. for the mixed gas, or 7·2 per cent. in favour of the coal gas. The average illuminating power of the coal gas being 0·3 candle higher than the mixed gas, a reduction of 12 units in the average calorific power should be made in the former for a strict comparison. This makes the corrected net average calorific power for the year 578·1 B.T.U. for coal gas, and 548 B.T.U. for the mixed gas (at similar illuminating power values), or 5·3 per cent. in favour of the coal gas.

Comparing the figures in the last columns of these tables, it

will be seen that the units per candle vary considerably—in the case of coal gas from 41·7 to 38·1, and in the case of the mixed gas from 38·1 to 35·4. It will be noticed also that the lower results occur in the winter months, and the higher in the summer months, in both cases. It is difficult to account for this; but as it is certain that the working of the calorimeter cannot be affected by the prevailing temperature, it would seem that the testings for illuminating power are so affected. I have thought that the pentane flame may be brighter and the candle flames give more light in proportion to sperm burnt in cold than in warm weather, which would account for it; and Mr. Trewby has suggested to me that the difference may be due to the test burner—the light of the flame being affected by the proportion of air supplied to it. Probably both these causes contribute to produce the result. These differences are more marked in the results of the daily testings than in the monthly averages, as may be seen in the table below :—

TABLE C.—*Monthly Maximum and Minimum B.T.U. Gross per Candle.*

Date. 1904.	Coal Gas.		Mixed Gas.	
	Max.	Min.	Max.	Min.
Jan. . . .	45·2	37·0	40·0	35 1
Feb. . . .	43·5	38 8	42·2	35·0
March . .	44·0	38·3	40·3	33·6
April . . .	41·9	37·8	39·2	34·1
May . . .	41·5	37·8	38·7	31·5
June . . .	41·9	36·2	38·1	35·2
July . . .	40·1	36·5	38·7	33·5
Aug. . . .	39·8	35·9	38·4	35·7
Oct. . . .	40·5	36·6	38·2	36·3
Nov. . . .	41·1	37·7	42·1	35·4
Dec. . . .	42·5	39·1	41·3	35·0

Incandescent Gas for Railway Carriage Lighting.

According to a recent number of "L'Elettricita," the "Liais" inverted incandescent gas-burner has been very extensively adopted by the chief Railway Companies of France for lighting their carriages, as the result of the experiments made by the Northern Company. As compared with colza oil, ordinary gas, and electricity, the system effects a saving of 19·7, 34·3, and 82·8 per cent. respectively, while the illuminating power obtained is 783, 417, and 149 per cent. greater. The French Company Paris Lumière have carriages lighted on this system running from Paris to the Sables d'Olonne, and from Paris to Meaux. Last October, some experiments were made on the Southern line, and about forty carriages are to be lighted. The burner has been in use on trains running between Paris and La Rochelle since October, 1903; and it is being employed for station lighting. It certainly commends itself on the score of economy and efficiency; and the result is that it is gradually superseding electricity.

A Test of an Air-Lift Pumping Plant.

The following results are given by "Engineering Record" as having been obtained in a test recently made on a Pohle air-lift pumping system installed in a large brewery. The compressor furnishing air was an Ingersoll-Sergeant 10 inch by 10 inch "E" machine, run at a speed of 100 revolutions per minute, corresponding to a piston displacement of 89 cubic feet of free air per minute. In this test the air and water pipes were lowered to a depth of 167 feet below the surface, for the purpose of cleaning out an accumulation of about 33 feet of sand and dirt which had gathered at the bottom of the casing. This necessitated the very deep submergence, and accounts for the unusual air pressure required at the compressor. After the well has been cleaned out thoroughly, the pipes will be raised until a depth of about 98 feet is reached, when an air pressure of 40 or 45 lbs. will deliver the required quantity of water. The details of the test are:

Original depth of well	223	ft.
Depth when the test was made	183	,,
Diameter of the well casing	7½	in.
Standing water level	14	ft.
Drop in level when pumping	21	,,
Lift above the surface	8½	,,
Total lift from lowest water level, when pumping, to the point of discharge	44	,,
Depth through which water and air pipes were lowered	167	,,
Submergence	74	p.c.
Quantity of water lifted per minute	264	galls.
Air pressure at starting	68	lbs.
Working air pressure	60	,,
Diameter of water-discharge pipe	3½	in.
Diameter of air-pipe	1½	,,
Horizontal distance from receiver to well	246	ft.

Among the bequests of Mr. G. Stanford Clarke, of Ipswich, who died on Oct. 26 last, leaving estate of the value of £25,500, is a sum of £150 to the superannuation fund of the Ipswich Gas Company, of which he was a Director.

THE CAPITAL EMPLOYED IN THE GAS INDUSTRY BY LOCAL AUTHORITIES.

[FOURTH ARTICLE.]

By C. E. JONES, Assoc.M.Inst.C.E.

PREPAYMENT METER SYSTEM.

To the credit of local authorities be it said, the custom of the small consumer is sought after, and his needs supplied by them, to a much greater extent numerically than by companies. The number of such consumers catered for by municipalities largely exceeds those of the same class in areas supplied by private enterprise. Part ownership is, so to speak, an inducement for a householder to trade with himself. Companies have failed to grasp this palpable fact; and by issuing shares of a value above the means of the small householder, have succeeded in alienating both his interest and his custom. Were gas shares of £1 value, instead of £10 and more, companies would create an army of small shareholders who would have a direct interest in promoting the consumption of gas and advancing the welfare of the industry. This actually takes place in a self-supplying community; and ratepayers are given distinctly to understand that, unless they use gas and support the undertaking in which they have a share and local interest, a rate-in-aid will be imposed to cover deficiencies. Hence it is that prepayment meters are more largely used by municipalities than by companies. Little encouragement is offered householders by the latter to become customers under the prepayment system. The charge for gas is fixed at a price so as to yield a good return on the hire of fittings; and the smaller the customer the more he pays relatively for such hire. A more liberal system is needed; and while every branch of the business should succeed in paying its way, there is such a thing as casting bread upon the waters and finding it after many days. The advantages accruing to the industry by the prepayment system are not to be altogether measured by the charge for the hire of fittings; and it is narrowing one's vision to view it in this way. To extinguish an oil-lamp by the substitution of gas-light is not only a local, but a national, gain—the one is a native product, the other of foreign origin. No housewife voluntarily reverts to the use of evil-smelling oil, with its trouble and danger, after having had experience with gas; and fewer fires and fatalities would take place were inflammable oil disused.

Charges for prepayment gas vary according to the services rendered—as, for instance, whether one fitting is supplied or two, one boiler, cooking-stove, &c. Some of the charges which follow seem made to encourage the use of the system, and others to discourage it. In two cases, 1d. per 1000 cubic feet only is imposed. Others charge 2d., 3d., 3½d., 4d., 5d., 6d., 7d., 9d., 10d., 12d., and one concern 13d. In some instances, meter-rents are not charged at all; while in others they are remitted either wholly or partially, according to the volume of gas consumed. No statute is required to regulate these rates; the competition of rival illuminants will do that, and the consumer may be trusted to employ the light he considers the best or most suitable to his requirements. Such Acts of Parliament are not at all creditable to the intelligence of the people, and grandmotherly legislation is fit only for a nation of fools. England claims the proud distinction of selling the cheapest gas in the world. Parliamentary interference, however, has tended to retard rather than to accelerate the beneficent movement. Laws for the regulation of inoffensive trades usually fail in their object, and exert an influence in restraint, and not in the direction of an extension, of what they were ostensibly made to promote.

APPLYING THE PROFITS.

While gas companies are by law prohibited from applying profits to any other than purposes of the company, any surplus moneys after paying authorized dividends are to be applied to the formation of a limited reserve fund and the relief of the consumer by means of a reduction in the price of gas. Local authorities are under no such restriction, and vote what are called profits to any purpose that may commend itself to the majority in power, who usually display special aptitude in this species of appropriation. Thus we find many municipal gas committees admitting the evil, bewailing their powerlessness to reduce the price of gas, and bemoaning the want of commercial knowledge and moral public responsibility of that type of representative whom the author (who has had extended experience in public life) dubs automaton. Having generally little or nothing to lose, often the nominee of some local *clique*, representing trade interests, social or political faddism, or sectarian bigotry, uninstructed in the most rudimentary principles of finance, and devoid of any inclination to remove his own ignorance, he presents the obtuse bosses of his pachydermatous armour in opposition to reforms having for their object the security and permanent consolidation of the undertaking, and the relief of the patient gas consumer from burdens belonging to, and which should be undoubtedly borne by, the whole local community instead of one class alone.

After discharging their current liabilities, there remains an annual aggregate profit at the disposal of local authorities of any sum between half and three-quarters of a million sterling, who, as is well known, devote it to local purposes of a varied and

diversified character; the following being some objects benefited by their liberality: Deficiencies in electric lighting accounts, previous deficiencies, deficit on water undertakings, bankers' overdraft, public libraries and purchase of books, new town hall and offices, museums, school improvement, street, town, and city improvements, parks, fountains, markets, railway sidings, pier deficiencies, general and sanitary purposes, depreciation and contingent funds, street lighting, insurances, district or borough rates, general improvement fund, borough and other municipal purposes, and works of general public utility. Many profits, we are told, are not yet appropriated; and some authorities ignore the request to indicate the objects to which surplus gas income is proposed to be applied or to afford information. The list is a very long one, but far from complete. Perhaps one of the most anomalistic purposes to which gas profits are so readily appropriated is that of supporting the strenuous efforts of electricity to supersede coal gas. The financial support extended to electric lighting by gas is most affecting—it touches the heart. Such a friend should not be despised or parted with in haste. Coming in adversity without invitation, is proof positive of the sincerity of friendship; and as to the usefulness of coal gas to its rival all are agreed. But, it may be asked, would any individual trader or manufacturing firm financially and without security support hostile rivalry in business? Verily, it is more blessed to *receive* than to *give;* and the end of the commandment is charity.

Conclusion.

Having now discussed, however imperfectly, the question of capital in its relations to structural, manufacturing, distributing, and commercial operations, it remains to notice briefly a few points which the discussion has established. It can be no longer urged that gas property acquired by local authorities is in general over-capitalized. The contrary has been demonstrated, and this division of the gas industry proved to be in a sound financial state. Facilities, absent in the case of gas companies, are present in that of municipalized undertakings for the reduction of the capital account. The latter may employ surplus funds in extending the plant and augmenting the capacity of the works; the former are compelled to devote such profits to the consumer by reducing the selling price of gas. Redeeming the capital would appear to be one of the cardinal points of municipal administration; but its operation unfortunately is not universal. Until recently gas companies were refused statutory power to reduce their obsolete or inflated capital. In theory, but not in practice, they maintained the fabric in such thorough order and condition as to justify the amount expended on it and appearing in the ledger. In the majority of cases, the nominal capital is in excess of the value of the works, or bears an exaggerated relation to it. Compared with companies, therefore, the nominal value of gas-works belonging to local authorities, as expressed in their accounts, is far below the market or intrinsic value. If this be a fault, it is suggested that it is one easily condoned.

In carbonizing results between the two divisions of the industry, there is a fair agreement. Divergencies, of course, are numerous, and the balance of efficiency in a state of oscillation. Volumetric production may be awarded to local authorities; more profitable realization of sales claimed by the companies. Managerial expenses are lower by about 8½d. per ton of coal carbonized in municipal works than in others. Directorial fees in the case of companies are partly responsible for this; but even when the figurative allowance is made, the balance is in favour of paid direction as against unpaid elective agencies, where, alas! commercial acumen is seldom conspicuous. However, £190,000 a year is an item in favour of the administrative economy of local authorities; and it has been contended by admirers of municipal trading that the lower price received from the sales of gas *per se* will account for the difference. But it is not yet demonstrated that the whole of the gas sold in the United Kingdom by local authorities realizes less than the companies' average price. In boroughs it may be so; but outside areas usually pay 10 to 25 per cent. more per 1000 cubic feet for gas than is imposed within burghal limits.

That waste in both divisions of gas practice extensively prevails, is painfully evident; and unaccounted-for gas demands, and is entitled to, more attention with a view to the adoption of preventative measures than it apparently receives. It should be stated, however, that some municipalized undertakings are excellently well managed; and as these produce the bulk of the gas, they tend to reduce the average. Were it not for this leavening process, the percentage of waste would be much higher than it is. Low-priced gas is seldom found where the leakage account is heavy. Many works boast the former and control the latter, curbing its tendency to run into two figures. In others, the contrary obtains, and flagrant waste of the finished article is tolerated with evident complacency. High prices and heavy leakage are twin-brothers. Three per cent. of leakage is an ample allowance. The Local Government Board must be considered as an accessorial agent before, and after, the fact in providing the means to maintain and perpetuate waste of gas by leakage. By withholding their sanction to loans, leakage would have to be stopped. Consumers (especially small ones) appear to have more confidence in elective administrators than paid directorates, who, it is well known, are occasionally leavened with elderly, wealthy, or other forms of amiable incompetency. Figures and experience show that the custom of small consumers is desirable and lasting, and, by broadening the foundations upon which the commercial structure rests, adds to its stability. An aggregate of small consumers is a decided acquisition to the list of customers. Often arbitrary, in a position to dictate his own terms, when the loss of his custom would interfere with, if not more or less dislocate, manufacturing operations, the large consumer is found to be an exacting customer. Small consumers, if dissatisfied, possess none of the advantages of their more potent exemplar. Their resources are mostly confined to dangerous oil or costly electricity; and they will hesitate long, and deliberate calmly, before adopting a rival light. Unquestionably, the policy of securing the small consumer, who one day may become a larger one, is to be commended. It is a gross mistake to leave him out in the cold, a prey to the oil vendor and others.

The application of gas profits to extraneous, foreign, or equivocal purposes, instead of devoting them, as in statutory companies, to a reduction in price, or wiping off gas liabilities, continues to be a popular mode of procedure; and much seductive eloquence is employed in justification of the policy. Nevertheless, it fosters a spirit of extravagance, and encourages prodigality in borrowing and spending "on the security of the rates;" and though no illegality is committed by applying gas profits to purposes formerly provided for out of the rates, it is a precarious, exigible, and one-sided system of finance, resting on a foundation unstable and unsafe. Local indebtedness is still advancing with alarming strides, and a halt is necessary. Relief of the rates is a delusion, if not a snare. Fruitful in scientific discoveries as the last century certainly proved to be, who can predict what secrets Nature intends unfolding, or imagine the progressive developments of the one over whose threshold we have passed, foretell the duration of the various systems of artificial illumination, or deny the coming supersession of coal gas? Who can circumscribe the wonders of the physical world, limit the boundaries of human reason, arrest the progress of speculative thought, erect barriers to oppose the advancement of the Genius of Invention, or retard the growth of the Temple of Science? The onslaught of radium on some of our pet theories, and its ruthless overthrow of accepted physical "laws" (?), is perhaps only a prelude to more astonishing and drastic changes. The power that created man set no limit to the exercise of his intellectual faculties or restraint upon their cultivation and productibility in furtherance of the material advancement of mankind. Nothing is absolutely permanent or unchangeable; the torch of Discovery still illuminates the dark avenues of time. This is not a fanciful possibility entirely; and the policy of surcharging gas consumers to bolster up pet schemes of the unthrifty should be denounced and abandoned. For those reckless rulers who esteem local indebtedness an honourable distinction, when deprived of the only really profitable plank in their trading platform, there is reserved a rude awakening, a cruel financial retribution.

Lubricating Gas-Engine Cylinders.—The January number of "Graphite" contains a letter on the subject of lubricating gas-engine cylinders by means of graphite. The method adopted is as follows: When the piston is turned up, the last cut is made with a diamond-pointed tool, with a feed slow enough to leave very fine lines on the surface, or what might be called slight corrugations. The inside of the cylinder can also be treated in the same way, if desired. The object is to form on the piston a slightly broken surface, which can be loaded with graphite; the result being that it faces up evenly, and the two materials—cast iron and graphite—come in contact with the cylinder. When once the graphite is crushed into the grooves, it is said to remain there permanently; but for all that it should be supplied regularly. In addition to the fine corrugations, it is stated to be advisable to cut round the piston grooves in the form of rings, which are always loaded with graphite and oil to reinforce the lubrication of the entire working surface. Engines treated in this way are said to run for several years without the cylinders having to be re-bored.

The Physical Constants of Pure Marsh Gas.—Some ten years ago Professor H. Moissan, in the course of his work on the production of carbides in the electric furnace, prepared aluminium carbide, and showed that in contact with water pure methane was evolved, thus giving a new and direct synthesis of this important hydrocarbon. In the number of the "Comptes Rendus" for the 13th inst., Professor Moissan and M. Chavanne give an account of their determinations of the physical constants of pure marsh gas prepared in this way. According to an abstract of the communication in "Nature," the methane, after being freed from traces of moisture and less volatile impurities by passing through a tube cooled to −85° C., is solidified by cooling with liquid air, and any more volatile gases present are pumped away. The gas allowed to boil off from the crystals was proved to be pure by combustion analysis, and possessed at 0° C. and 760 mm. pressure a density of 0·5547—the theoretical density being 0·555. The melting and boiling points were measured by means of an iron Constantin thermocouple, previously standardized against a petroleum ether thermometer; the crystals melting sharply at −184° C. and boiling at −164° C. at atmospheric pressure. The authors add that the methane, purified in this way, always possessed a sweet, faint garlic odour, which cannot be attributed to impurities, and must be regarded as due to the gas itself.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of the Association was held last Thursday at the Grand Hotel, Birmingham. The attendance was about an average one. At the opening of the proceedings, the retiring President, Mr. GEORGE HELPS (of Nuneaton), was in the chair.

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held at Earl's Court during the Gas Exhibition; and they were confirmed.

THANKS FROM SIR GEORGE LIVESEY.

Replying to the resolution passed at the last meeting, sympathizing with him in his recent illness, Sir George Livesey wrote the following letter, which was read by the Hon. Secretary.

Reigate, Dec. 17, 1904.

Dear Mr. Cooke,—Please convey my hearty thanks to the members of the Midland Association of Gas Managers for their very kind expression of sympathy with me in my recent illness, and congratulations on my recovery.

I noticed the manner in which the motion was put at the meeting, and in which it was received by the members. I can assure them all that their kindness, and that of so many other gas friends, has greatly moved me, and has been a source of much consolation during my confinement at home. I think your good wishes that I may soon be restored to my usual health will, I am thankful to say, soon be fulfilled.

Believe me, yours sincerely,

GEORGE LIVESEY.

REGRETS.

Among several letters apologizing and regretting absence from the gathering, was one from Mr. Charles Hunt, in which, having expressed his sorrow that he could not be present at the meeting, he took the opportunity of thanking Mr. A. Cooke, of Oldbury (who occupied the office of Hon. Secretary during the years Mr. Meiklejohn was holding the higher appointments of the Association), for his work during the year that he (Mr. Hunt) was President of the Association. He hoped that before long Mr. Cooke might be seen occupying the presidency. Mr. J. S. Reeves, of Bilston, was also unable to be present, owing to an injury he had sustained while out driving.

NEW MEMBERS.

Mr. R. O. PATERSON (Cheltenham) proposed, and Mr. W. A. SAPEY (Tamworth) seconded, the election as members of the following gentlemen: Mr. A. T. Harris, of Sileby, and Mr. Harold Barker, of Buxton.

REPORT AND ACCOUNTS.

The annual report and accounts were next submitted. The former reviewed the proceedings of the past year, and referred to the affiliation with the Institution of Gas Engineers. The Committee also placed on record the loss sustained by the death of Alderman John Annan, of Wolverhampton, one of the oldest members of the Association, and a Past-President. It was also reported that during the year seven new members had joined the Association, one had died, one resigned, and one had ceased to be a member under rule 15, leaving the membership at 105. The Committee recommended that the District Association reports be presented to all members not in arrear. The accounts showed that the receipts amounted to £161 16s. 5d., including a balance of £107 4s. 7d. brought forward. After meeting the expenditure, the balance at the bank was £117 9s. 3d.

On the motion of the PRESIDENT-ELECT (Mr. T. Berridge, of Leamington), seconded by Mr. W. R. COOPER (Banbury), the report and accounts were adopted.

Moved by Mr. J. T. LEWIS (Wellingborough), and seconded by Mr. COOPER, it was agreed, in compliance with the Committee's recommendation, that the volume of reports of the District Associations should be distributed among those members not in arrear.

The CHAIRMAN said another matter was the election of the District Member of the Council of the Institution of Gas Engineers, in accordance with the terms of affiliation. He had much pleasure in proposing that their esteemed President (Mr. Berridge) be asked to undertake this duty.

Mr. B. W. SMITH (Walsall) seconded the motion; and it was unanimously adopted.

Mr. BERRIDGE, in acknowledging the confidence of the members, said it was clearly understood that the election was for one year only. At the end of the year, the members would again have the pleasure of electing anyone they liked.

THE PRESIDENTIAL CHANGE.

The CHAIRMAN said it was now time for him to relinquish the honour of serving the members as President of the Association. The past year had been an uneventful one; and he was afraid that internally very little had been done. They had had only one paper. Thanks, however, to his worthy predecessor, Mr. Meiklejohn, they had accomplished something by affiliating themselves with the Institution of Gas Engineers. Another fact of importance was that the Gas Exhibition at Earl's Court had been held during his own year of office; and doubtless this would be considered by them all in the future, if not in the present, an historical event. He had nothing more to do, but to hand over the chair to his worthy friend, Mr. Berridge. He (Mr. Helps) was sure he would occupy it with that geniality and dignity for which he was so distinguished.

Mr. BERRIDGE, on taking the chair, was heartily received. He said the first duty he had to perform was to propose a cordial vote of thanks to their late President for the way he had conducted the business of the Association during the past twelve months. They had from Mr. Helps a very elaborate and interesting address. He was glad that this was so, because on the present occasion the address was going to be half as long, and contain half as much interesting matter. The visit to Nuneaton, too, was full of interest, and the works full of novelty; and the large assembly on that occasion included the President of the Institution of Gas Engineers (Mr. H. E. Jones). When, however, the members visited Leamington, he was afraid they would not be able to show them there many novelties; and they would have to depend upon the beauties of the neighbourhood and town to induce the members to come. One thing was the members would have a very hearty welcome. Mr. Helps was a man of great ability, of great inventive power, and it had been to them all a pleasure to sit under his guidance during the year.

Mr. PATERSON, in seconding the motion, said it was true they had not had many papers during the year, nor a great amount of business at their meetings. He was sure they would not forget the interesting visit paid to the President's works at Nuneaton; and what they saw there was of sufficient novelty to induce them to look forward to Mr. Helps's career with a considerable amount of pleasure and anticipation.

Mr. COOPER supported the motion, and it was carried.

Mr. HELPS said he was much indebted for the happy manner in which this motion had been proposed and spoken to; and also for the hearty way in which the members had received it. It went without saying that he had attempted to do something. Whether he achieved it depended entirely upon how the members looked at it. A friend of his had told him that if printers' ink and taxing the members' patience had anything to do with success, he (Mr. Helps) would have had a fair measure of it. He wished the members to take that in another light, and to believe and regard the printers' ink as a measure of the anxiety under which he had had to work in some way or other. Whether or not it had been useful work, he was not prepared to say. However, he wanted the members, if they would, to take that as a measure of his anxiety to show his appreciation of the honour they did him in electing him to the high office of President.

MR. COOPER'S RETIREMENT.

The PRESIDENT said the members would have been interested to see in the gas journals that Mr. Alderman Cooper, J.P., had recently been nominated to a seat at the Board of his Company, and he was sure that the members would wish to express to Mr. Cooper their wish that he might have health and happiness to long occupy his new and distinguished position, and that it would be many years before he ceased coming to the meetings of the Association.

Mr. W. NORTH (Stourbridge), in seconding, said his acquaintance with Mr. Cooper dated back a good many years; and this occasion recalled many reminiscences of old friends who had passed away. Mr. Cooper was a worthy member of their Association, and one who deserved the recognition his Directors had accorded to him.

The motion was carried with marked regard and good-will.

Mr. COOPER said there came a time in the life of all men when they were called to lay down their tools; and he accepted the earnest congratulations of the members in the same kind manner in which they were tendered. But he assured those present, although it was the time of retirement for himself from some of his associations and connections, it gave him great pain when he thought that the severance he had got to make was from the post of activity with the Company with which he had been associated for the long period of 46 years. He could only say to the younger members of the Association: "Do not be over-anxious about the time of retirement, but be thoroughly anxious to do your duty while in harness. The time will come for you to retire, depend upon it; and so do all you possibly can for the undertaking with which you are associated while health and strength are given you. Then, I assure you, you will reap that reward, when old age comes upon you, that you rightly deserve." He thanked the members one and all most sincerely for their vote.

ILLNESS OF MR. F. L. RAMSDEN.

The PRESIDENT remarked that most of the members were aware that the Engineer of the Burton-on-Trent Gas-Works was seriously ill; and it was only right and proper that they should have a vote of condolence passed at this meeting with their friend in his great trial.

Mr. J. FERGUSON BELL (Derby) said that Mr. Ramsden was, as most of the members were aware, suffering from a very serious illness; and he was sure that it would be a source of comfort to their friend to know he had the sympathy of the members of the

Association. Not six weeks ago, he saw Mr. Ramsden in prime health; and within the month he heard that Mr. Ramsden had been stricken with a grievous complaint. He (Mr. Bell) had known him for about 20 years. He was not very generally known in the profession, but was a man who was honoured as a gas engineer, and was one who had served most faithfully the undertakings with which he had been connected. He therefore proposed that a letter of sympathy be sent to Mr. Ramsden, with the hope that he would soon be restored to health and strength. It seemed to him (Mr. Bell) a piteous thing that a man in the prime of life should be stricken in this way.

Mr. H. FOWLER (Midland Railway, Derby) seconded the motion, remarking that he had long known Mr. Ramsden; and he did not know a man more devoted to his profession.

The PRESIDENT observed that he, too, had always known Mr. Ramsden as a helpful and kind friend.

The motion was unanimously carried.

The PRESIDENT then read his

INAUGURAL ADDRESS.

Gentlemen,—it is with some trepidation that I appear before you to-day to deliver the Presidential Address. At our meeting in London I expressed my appreciation of the honour you have so kindly conferred upon me; and it will always be my desire to forward the best interests of our Association. Still, I cannot help but feel that there are others far more capable than I am to occupy this chair; and while I look back upon the list of Past-Presidents—some of whose names, when we shall have done our last "shift" upon earth, will undoubtedly be handed down to future generations—I again feel my unworthiness. However, I trust your time will not be spent unprofitably. Although perhaps I have not any great or new subject to lay before you, yet I may say something which will be of interest to you.

First, let me congratulate you upon being amalgamated with the Institution of Gas Engineers. We have now an Association which represents the British Coal-Gas Works, and one that can speak with authority in the interests of the industry. We have lost much in the past by not being organized, and have suffered at the hands of Parliament, road and rating authorities, electricity and oil competition and misrepresentation, trade rings, and trade unions. With the aid of our Institution and the Gas Companies' Protection Association (and the latter I recommend all gas companies to join), we are in a strong position to maintain and uphold our rights.

Secondly, may I congratulate you on the continued prosperity of our important industry, which has been shown by the splendid Gas Exhibition, recently held at Earl's Court, London. I am sure the gratitude of all gas engineers, directors, shareholders, and local authorities owning gas-works, is due to the gentlemen who promoted, to those who acted on the Advisory Committee, and last, but not least, to the firms who exhibited their goods, for the excellent manner in which they worked together to produce the finest show of gas apparatus ever displayed.

Not only has our continued prosperity been shown by the Gas Exhibition, but I am glad to know that, notwithstanding the wave of trade depression which has passed over most of the country, almost all gas-works show an increase both in consumption and profits. Undoubtedly, much of this increase is due to the exertions of individual managers; but it does also show that, although we now have no decided monopoly, the public still appreciate at somewhat of its true worth the benefits to be derived from the use of gas for lighting, heating, and motive power, despite the efforts being put forth by our rival, electricity.

In this connection, I may say that the advance in Leamington in sales last year amounted to $4\frac{1}{4}$ per cent., although we are not a town having an increase in the population.

Perhaps one of the greatest benefits to be derived from our meeting together is to give one another a little assistance towards greater efficiency. Twenty years ago I was told by one of the most eminent engineers then living not to try and make more than 9000 cubic feet of gas per ton of coal. I wonder what he would say, if he were now alive, on being told that we are not only making, but being paid for about 11,000 cubic feet of 17-candle gas, from material out of the same coalfields and without any enriching apparatus. This is the result of regenerative furnaces and George Helps's patent hydraulic mains, of which we have now thirty-seven working. I estimate the increased make due to the last-named arrangement at 600 cubic feet per ton—a by-no-means insignificant achievement.

Our works are, as most of you know, in the centre of a residential town. I am glad to say we are able, by drawing air through the purifiers for about a week before each change, to avoid being a nuisance to our neighbours. We have recently effected a considerable saving in the labour for emptying and changing the purifiers, by the erection of a steam-crane on the gantry. We have also put in a box of Jäger's grids, and are so satisfied with the results obtained that it is our intention to extend the use of them. And here let me remark that I do not believe in spending too much capital on purifiers. Make them large enough, but put them on the ground floor, and out in the open. No building is necessary.

Eighteen months ago we started one of Holmes's washers, and commenced to recover the cyanogen out of our gas by the process of the British Cyanide Company, as described by our worthy Secretary and Past President, Mr. Meiklejohn, in February, 1903. I am pleased to report that it is a decided success—paying $17\frac{1}{2}$ per cent. on the outlay, and proving useful in abstracting a certain amount of bisulphide of carbon.

We find no difficulty in removing all the naphthalene out of our gas; and our thanks are due to Messrs. W. Young, S. Glover, T. Glover, J. F. Bell and others, for putting us on the right track in this matter.

Our esteemed Past-President, Mr. J. Ferguson Bell, of Derby, in 1890, pointed out the need for standard fittings and meter connections. It will be seen from the following announcement, recently published in a Birmingham paper, that the plumbing and allied trades are before us in this matter:—

"As a result of a series of conferences held in London of the plumbing and allied trades, something like a revolution will be caused in the plumbing industry of the country. The manufacturers have decided to standardize all water pipes and fittings, making them interchangeable throughout England, Scotland, Ireland, and Wales; improving the quality and saving enormous wastage of water by corporations and water companies. Even the metal and component parts of the fittings will be standardized; and all fittings will have to undergo a test of 400 lbs. pressure to the square inch. Provision is also made that ball-valves—a never-ending source of trouble to householders—shall in future be made of gun-metal. All new fittings and inventions will be inspected by a permanent committee before they are allowed to be generally used. The Board of Trade and Admiralty are in sympathy with the movement, and standard sizes will be adopted by the Metropolitan Water Board and corporations. Manufacturers will save large sums in so far as they will not have to keep a variety of patterns, and will be able to manufacture cheaper."

It appears to me the method of valuing gas-works, when they are sold to local authorities, is a wrong one—based as it is on so many years' purchase of the profits. In the case of a gas-works that is economically managed with a low capital, the amount required to pay the full statutory dividend is small. The gas is sold cheaper and the profits less. Manage a gas-works badly, charge a big price for your gas, make large profits, and get more money for your works when handed over to the local authorities—that would appear to be the inducement under the method of valuation at present adopted. To my mind, the right thing to do is to keep down your capital account as low as is compatible with your circumstances. At Leamington, the expended capital comes out at £3 9s. per ton of coal carbonized; and this, I consider, is a reasonable amount.

And now let me turn to a question which I have previously had the privilege of bringing before this Association—the question of education as concerned with the training of the gas engineer. We are passing through a period of transition. A rapid succession of scientific discoveries has profoundly influenced industry; and the one in which we are particularly interested is, and must be, one of those most affected. Most of us remember the wave of prophecy that passed over the country when the electric light emerged from its infancy and became a thing to be reckoned with. The days of gas lighting were said to be numbered, and there were the most gloomy forebodings. We have outlived that phase; and I believe that we shall outlive many another. Electricity has been a friendly rival, and has stimulated gas engineers to develop their industry in a manner that was scarcely deemed possible. More economical production has been combined with more economical combustion; and the problem how to get a maximum amount of illumination from a minimum amount of gas has been solved (though the last word has not been said) by the introduction of the incandescent system and the employment of devices for burning under pressure.

Now, what is the bearing of all this on the question of education? It is that a knowledge of Science is of the greatest importance for all of us, from the engineer in charge to the humblest employee; that if, indeed, we are to hold our own against other industries, we must become more and more scientific, prepared not only to adopt and put in practice the inventions of the pure scientist, but we must be on the alert to receive and put in practice all that Science has to teach us. I have previously suggested that Science and practice are reciprocal; that any forward step in the one immediately acts upon the other. It is for this reason that I would again impress upon you the importance of taking such steps as are possible to secure that those joining our profession should have a sound scientific training. If there ever was an industry which needs for its successful commercial development a knowledge of Science, it is the one in which we are engaged. I firmly believe that our continued progress must depend largely upon the extent to which those engaging in the industry receive a training in Science. Notwithstanding the large developments that have taken place since the passing of the Local Taxation Act of 1890, there is still an enormous amount of leeway to make up. The number of technical schools has been increased, and their efficiency has been increased. Yet there is still a need for schools of Applied Science—schools in which youths, and even adults, might receive instruction in the highest branches of an industry such as that in which we are engaged.

It is necessary for our young men to be well equipped in every branch of their business; and the gas engineer of the future, besides knowing full well the chemical, mechanical, and commercial sides of the business he is engaged upon, should also have a fairly extensive knowledge of the allied industries. He will not then be at a loss when called upon to advise and help other manufacturers, and promote also his own business by the introduction of

gas for various purposes. Again, the introduction of electricity into our works to cheapen the labour item, as has been done recently, and the high efficiency now attainable by the use of a gas-engine and dynamo, in conjunction, for places where electric light or power is desirable owing to special circumstances, means that the new gas manager must also be somewhat of an electrician —not necessarily, of course, a man to design a dynamo or motor, no more than a gas-engine, yet one who can do a little wiring, examine a generator or motor, and note and detect faults, find leakages of current, and do, or supervise the doing of, small general repairs. This will mean that the man so trained will not be a book-student merely, but practical in the working sense, and able to carry out scientific research work on his own account; trained to keep his eyes wide open, and to calculate out for himself—all of which make for economical management.

Notwithstanding the efforts made by the Department of Technology of the City and Guilds of London Institute, which has done much to stimulate such teaching, there is still a great need for schools of Applied Science. I am well aware that all such teaching, to be really fruitful, must be based upon a sound general education of a modern type; but considerable progress has been made in this direction. The teaching of the fundamental principles of Science has been introduced into our elementary school system and into our secondary schools; and there is little difficulty in the way of a boy who wishes to receive a good education on modern lines. It cannot, however, be said that a youth in an industry such as this can, without difficulty, secure that specialized technical training which I believe is so necessary to our continued welfare and progress.

It is as well that we should see what other countries are doing in this respect; and we cannot do better than turn our eyes to that country which so avails itself of scientific discovery that it was able practically to monopolize that huge and important industry which deals with coal tar products. Not only has Germany an excellent primary and secondary school system, but scattered over the country are schools of a special type—schools for the textile industries, for the metal industries, for the woodworking industries, and for the chemical industries. These schools are having a most important effect on German industry; and I would strongly recommend to your notice the valuable series of Consular Reports written by Dr. Rose (late His Majesty's Consul at Stuttgart) on various industries in Germany. I would particularly direct your attention to those dealing with chemical instruction and chemical industries in Germany. From these, you will learn in what a remarkable manner scientific investigation has fed a large and growing industry and how this industry and chemical teaching have been reciprocally helpful. We find from these reports that—

"In 1835 Runge in Berlin discovered aniline, and in 1845 Hofmann benzol in coal-tar. In 1835, Mitscherlich discovered nitro-benzol; and Zinin showed in 1841 that it could be converted into aniline by reducing agents. Mansfield, working in Hoffmann's laboratory devised a process for the production of benzol from coal-tar on a large scale, and by this means rendered the production of large quantities of aniline by way of benzol and nitro-benzol possible, as aniline itself only occurs in coal-tar in very small quantities. These chemists may be considered to have laid the foundation of the German aniline dye industry. The discoveries of the various colours then commenced, and have now run far into the thousands.

"In 1868 Graebe and Liebermann dealt the death-blow to dyes prepared from the madder-root by their discovery of the preparation of the artificial alizarine colours from the anthracene contained in coal-tar. In France alone the cultivation of the madder-root, estimated at an annual value of £1,700,000, was consequently abandoned. This industry was fostered and increased by Napoleon I., who introduced for this purpose red as the colour of the trousers of the French infantry.

"The rapidity of the decline in France is shown by the following figures:—

Year.	Madder-Root.
1870	25,000 tons.
1873	23,000 ,,
1875	14,000 ,,
1878	500 ,,

"The red colour is still used for the uniforms of the French infantry; but it is now almost exclusively manufactured in Germany.

"Of the world's annual production of alizarine in 1890 amounting to about 25,000 tons, Germany alone contributed about 22,000 tons.

"After a short pause, the discoveries of new aniline and other colours began again, and continued almost exclusively in Germany, forming perhaps the most brilliant period of organic chemical research applied in industrial purposes in the history of chemical industries."

It would be out of place here to show in what a remarkable manner these discoveries have influenced German industry; but they have led to the establishment of huge chemical works employing a vast amount of capital, and yielding large dividends to investors. The total value of the German chemical industry in 1897 amounted to £47,000,000; and it appears difficult to place a limit to its development.

If we turn to the important and growing electrical industries, we find very much the same story—a rapid growth of the industry combined with the provision of means for getting technical instruction of the highest character. It is clear that Germany, as well as other countries, has discovered the importance of technical education; and it remains for those interested in this and other industries in England to awaken to the great and increasing need for action. One was glad to read in "The Times" of the 27th of September last, the following letter:—

"Sir,—Among the many problems in technical education the training of the technical chemist is engaging special attention at present; and it is for that reason that I venture to trouble your readers with what I believe is a new experiment in this direction. In the first place, the technical chemist should have a thorough training in the pure science of chemistry. Any slurring over this is bound to prove ultimately fatal to his real value. Without it, he becomes a mere analytical machine. But besides and beyond this, he requires some practical acquaintance with manufacturing operations on a large scale, and the problems which are met with as soon as he has to translate the processes conducted in the laboratory into those conducted on a manufacturing scale. Something can be done to prepare him for dealing with these problems in the University or Technical College where he is trained. He can learn some of the elements of engineering, including machine-drawing; and he can be put through an experimental course in evaporation, distillation, &c., in which he uses apparatus built on a sufficiently large scale and based on the best commercial models, so as to enable him to study the economic as well as the scientific problems involved.

"But when all this is done, he is not a technical chemist. There has been nothing in his training corresponding to the training of the engineer in the workshop.

"With the view of meeting this want in his training, the Governors of the Heriot-Watt College have made an arrangement with the Edinburgh and Leith Gas Commissioners by which the Heriot-Watt College chemistry students spend six months in the gas-works laboratories after being two years in the College, and another period of twelve months after being three years in the College.

"A modern gas-works offers to the chemist a broad training in technical chemistry. He has every opportunity of studying all the main problems connected with the combustion of coal and the products obtained by handling it in different ways; and he is also brought in contact with manufacturing processes on a large scale in the working up of various by-products, and becomes familiar with many important organic substances. In fact, it is evident that it would be difficult to find any other chemical process in studying which a student would get a broader foundation for his future career as a technical chemist.

"In another direction the Governors are making a similar experiment for the training of brewing chemists, by an arrangement with a leading brewing firm in Edinburgh, by which the 'Sandwich system,' as now applied to the training of engineers, is extended to brewing apprentices who will alternate their training in the College with their training in the brewery.

"As the brewery is next door to the College, this plan can be readily carried out; but it might well be applied to other branches of chemical manufacture. These are, I believe, new departures, or I would not have troubled your readers with them, and I cannot help believing that the result will be to turn out a type of chemist which the man of business will feel confident in trusting with important manufacturing operations."

"A. P. Laurie,
"Principal, Heriot-Watt College.
"Heriot-Watt College, Edinburgh."

The profitable management of works must always be the predominant consideration with gas managers; and the factors upon which this depends need careful study. In this connection, may I venture to call your attention to the Presidential Address recently delivered before the Institution of Electrical Engineers by Mr. Alexander Siemens. He makes the sweeping statement that the true foundation of modern civilization was the lowering of the cost of production; and that this implies the employment of all the knowledge we could acquire and of all the training the best schools could give us. The result of this would be greater ease in obtaining the necessaries of life; and this would leave time to cultivate other aspects of our existence.

Analyzing the problem of the lowering of cost of production, he points out that works ought to be planned and equipped so as to turn out the maximum of produce, and that the handling of materials should be reduced to a minimum. The cost of the raw material must, of course, be kept as low as possible. The question of the workmen is a most important one; and the rate of working is a great factor, not only because it becomes practically a question of rate of wages, but because of the bearing of the output on the fixed charges. We must keep in mind that rent charges, interest on capital, and cost of management, are fairly constant with a varying output; and the problem we have to solve is that of producing as large a quantity of gas as possible with a minimum of expenditure, and to stimulate the consumption of our production.

Although, so far, I have not deemed it advisable to bring the matter of labour-saving machinery before my Directors, it has nevertheless received my very careful consideration; and possibly in the near future we shall install some form of charging and discharging machinery for the retort-house, and also the necessary elevators, conveyors, &c., for the bringing in of coal and the removal of coke. To show the great advance which has been made during the last few years in the general view of things, and also the adaptability to circumstances which is possible, we have only to consider the question of the introduction of electricity into gas-works. But a few years ago, it would have been considered an almost suicidal policy to have even admitted the possibility of the use of electricity in the manufacture of coal gas; and I am afraid some of us have not even yet quite realized what it means. It opens up a wide field of what may quite possibly turn out a new era—perhaps not in the sense in which the incandescent light made its impression, but in the mechanical department quite as effective. I am aware that some of our friends who have

a mechanical turn of mind, have already utilized the dynamo by driving from the shaft of the exhauster engine or workshop shafting for lighting up the purifying-house, &c.; but the greatest factor in bringing about this change of front is the introduction of machines like the De Brouwer and Paris charging and discharging machines. The adaptability of this class of machine is so pronounced that, within the last year or so, they have been rapidly followed by others—such as the Broadhead and Toogood, the Fiddes-Aldridge, Gibbons, and several others. Within the next few years, development of machinery in this direction will take up much of the time and earnest work of many of our best men.

Another point upon which many of us have had to alter our opinions has been in regard to the pushing-out of coke, instead of drawing. If it were possible sometimes to invert our modes of thinking, perhaps we should be able to see further than we sometimes do. Nearly all effort had, up to recently, been made by imitating the stoker; and thus we have a drawing machine. This is right so far as it goes; but it is now possible to put in a level and homogeneous charge which was not so possible by the older method of charging, either by hand, scoop, or machine. Now, given a solid homogeneous mass well cooked off, and with all the liquid hydrocarbons volatilized, another factor is brought into play; and it is found possible to push out, without jamming, a full charge of coke from a through retort. Given a properly burnt-out charge, the labour necessary to start such a charge is eight men; and to keep it going, some six men would be sufficient. However, to meet the need of every case, and also loss in working continuously, greater power would be rendered necessary; and, in practice, it is found that three-horse power is sufficient, with (say) a margin of one or two horse power to meet extreme cases. Taking now this fact with the knowledge that three-horse power is amply sufficient for charging a retort by such a machine as the De Brouwer, it brings down the size of the plant necessary to within the possibilities of comparatively small and medium-sized works, which, up to a short time back, were obliged to employ hand labour—there not being enough work to pay, by its saving, the capital charges even of the large installations so successfully in use in many of our great gas-works.

As illustrating somewhat my meaning, take the instance of the Leamington Gas-Works. We have one retort-house, containing in all twenty beds of six throughs, 20 feet long. Each bed carbonizes on each side 4 tons per 24 hours, six-hour charges. There is, therefore, a total possible carbonizing power of (say) 160 tons per 24 hours. But this is, of course, never reached. The men are paid 5s. 2d. per twelve-hour shift; and each man does 3 tons and attends to two fires. To each six stokers, there is one man as coal wheeler and one man as coke jack—each paid 4s. 6d. per shift. The cost of carbonization is, therefore, 2s. 3d. per ton. This includes attention to furnaces. If, now, stoking machinery of the type I have indicated were put down, then for the whole house only two machine men and one attendant per shift would do the work—one man being charging and the other discharging, the attendant being for looking after the machinery, &c. The coke jacks as before, coal men and fire men, all would cost about 1s. 2d. per ton, or a saving of 1s. 1d. per ton. If, however, the installation were completed by having a coke conveyor and the necessary hoppers, there would most probably be a further saving of 2d. per ton, bringing down the cost of carbonization, including firing and coal into and coke out of the retort-house on to the heap, to 1s. I am well aware this is not a fancy low figure; but I believe it is a fair working one. Adding now to this the capital charges and depreciation on the above plant, which I estimate would be covered by (say) 9d. per ton, makes a total of 1s. 9d.; or, after all interest had been paid, wear and tear made good, and plant depreciated, there is a saving of 6d. per ton. This means about £550 per annum in our case, besides having to depend less upon the human factor than by having all hand-labour. I have, I believe, erred if anything on the heavy side of costs, and probably some of my friends will readily say that it can be done cheaper. But any cheapening means more to the balance of profit. However, I am not as yet prepared to carry out any scheme; and in the course of but a short time, it is very probable that with the active minds so busy at work on the reduction of retort-house labour to a minimum, yet further schemes will be developed.

The retort-beds now at work at Leamington are, as I have intimated, in settings of sixes; and I prefer this setting as it allows of a first-class combustion chamber, and even distribution of heat, and there are no "bull's eye" retorts to burn out or sink. Any future extension would in my case be upward—still keeping to the rows of twos in each bed—and be either four vertical rows of twos, or five vertical rows of twos. However, here again active minds are engaged upon the carbonization of coal; and we are watching carefully the results of the experiments now being carried on in the direction of vertical retorts of various patterns, small retorts, a large number of which are placed in one setting, or very large retorts for carbonization in bulk. Surely it cannot now be said that we are asleep as regards retort-house work!

I have before advocated the starting of a Junior Association. I wish it were possible to interest that eminent man, Sir Oliver Lodge, on their behalf, and form an Association for assistants, which might meet and have classes at the Birmingham University. I acknowledge, with gratitude, the benefit I received when a young man by attending specialized forms at the Nottingham University; and I cannot help thinking we do not make full use of our opportunities in the Midlands.

Some time ago we started a maintenance scheme in connection with incandescent burners; and we now undertake the supervision of all incandescent lighting in private houses, offices, shops, and warehouses, at a reduced nominal charge of 1d. per burner per quarter. The burners, chimneys, and globes are cleaned periodically. Mantles, &c., are renewed at consumers' discretion, and paid for in addition, but consumers can find the mantles if they so prefer. We find the arrangement gives great satisfaction; and although our charge only covers one-half the cost, I would go further and undertake to do all this work free. I find to do this would cost us ¼d. per 1000 cubic feet of gas sold; but I am sure it would be money well spent.

I do not think that, as an Association, we give sufficient attention to the commercial side of our work; and I believe we should do well to follow the example of the managers in the Manchester district, and place before each other a periodical statement of coke in stock, local prices of same, contract rates, &c., instead of selling one against the other, as is so often the case. These remarks apply to tar, sulphate of ammonia, ammoniacal liquor, and other residual products. I am not advocating a ring—no one dislikes the meter, tube, coal, tar, &c., rings more than I do. We cannot attempt to fix prices; and we want nothing but what is fair. But if we had a sheet of returns of the figures obtained around us knowing the carriage, we should be able to quote accordingly.

At one time, we found great difficulty in disposing of our refuse lime, and had accumulated a stock of about 1000 tons. We could not sell it; nor, indeed, give it away. It was then decided to put down a machine and crush it. We found a demand for crushed lime, and could now easily sell twice our make.

We are at this moment installing a "Millennium" plant for lighting our works, and a few neighbouring lamps at a pressure of about 50 inches. I believe I am right in taking it that you have all seen this apparatus at work during the Earl's Court Exhibition; so I need not describe it now. But it will be interesting to quote from Mr. J. W. Blakey on "The Case for Gas Lighting" in "The Street" for January—

"The following results of exhaustive photometric tests recently made are translated from the 'Journal für Gasbeleuchtung' of Feb. 13, 1904 the organ of the German Society of Gas and Water Engineers, conducted by Dr. H. Bunte, of Munich, one of the greatest authorities in Europe—and have been confirmed by the actual commercial results obtained in 143 German towns, the statistics of which have been compiled by Messrs. Barth, Kautney, and Knappich:—

Illuminant.	Candle Power.	Consumption per Hour.	Consumption per Candle Power per Hour.
		Cubic Feet.	Cubic Foot.
Coal Gas.			
Split burner	14	5·70	0·4071
Argand burner	28	8·90	0·3178
Incandescent light	63	4·24	0·0673
Millennium light.	1232	42·40	0·0344
Electricity.		Unit.	Unit.
Bremer light	1000	0·4 to 0·6	0·00050 (mean)
Arc lamp	500	0·375	0·00075
Nernst lamp	180	0·218	0·00121
Liliput arc lamp	130	0·160	0·00123
Incandescent lamp	16	0·055	0·00344

The superiority of gas at a pressure of 53¾ inches water column is best shown by expressing the above results in the terms of a common standard of 1000 candle power for one hour, with the respective costs, taking London prices for gas at 2s. 8·061d. per 1000 cubic feet, and electricity at 4·096d. per Board of Trade unit—these being the actual average prices of gas and of electric current respectively delivered in London and suburbs for lighting purposes, according to the last published returns. The cost of carbons for arc lamps is not taken into account, but would amount to an additional ¼d. per hour.

Illuminants.	Description.	Candle Power.	Cost per 1000-Candle Power per Hour.	Comparative Cost, taking the Millennium Light as 1.
			Pence.	Pence.
Electricity.	Incandescent lamp	1000	14·090	12·77
Coal gas	Split burner	,,	13·052	11·83
,,	Argand burner	,,	10·189	9·23
Electricity.	Liliput arc lamp	,,	5·038	4·56
,,	Nernst lamp	,,	4·956	4·49
,,	Arc lamp	,,	3·072	2·78
Coal gas	Incandescent lamp	,,	2·158	1·95
Electricity.	Bremer light	,,	2·048	1·85
Coal gas	Millennium light.	,,	1·103	1·00

High-pressure gas has no serious competitor; its cost for a given candle power being only 54 per cent. of the Bremer, 51 per cent. of the incandescent gas-lamp, and 36 per cent. of the electric arc lamp. Significant commentaries on these comparisons are provided by the Westminster City Council, which accepted the tender of the Gaslight and Coke Company for the public lighting of Aldwych (the Strand Improvement area) with high-pressure gas. The Holborn Corporation has also adopted the system for Kingsway, &c.

The economy and public convenience of such a system are not only obvious, but it claims superiority over all other systems of lighting, including the important factor of the initial cost of installation, which

is confirmed conclusively by a comparison of the tenders submitted for the public lighting of Aldwych (Strand Improvement area). They are as follows:—

—	Cost of Installation per Lamp.	Cost per Lamp for Maintenance and Supply of Light per Annum.
	£ s. d.	£ s. d.
Gaslight and Coke Company (Millennium system).	20 0 0	15 10 5
W. Sugg and Co. (gas).	32 2 6	24 12 6
Scott-Snell Self-Intensifying Gas Lamp Company	33 15 0	25 0 0
Charing Cross and Strand Electricity Supply Corporation	45 0 0	27 0 0
Metropolitan Electric Supply Company	45 0 0	27 0 0

For some years now the unaccounted-for gas at Leamington has averaged ½ per cent. above or below 3 per cent.; and in my opinion, unless there are mines in the neighbourhood, or some special reason, no gas company, using reasonable precautions in laying their mains and services, and taking care of their gasholders, ought to have over 4 per cent. of leakage.

The strain of competition has made us, as gas manufacturers, look round more than was once the case for new business; and we have found it in several diverse directions. The prepayment meter business, gathering in the small consumers, is now an established fact; and, except so far as the apparatus given with the meter, there is very little difference in the methods of procedure. We give 28 feet for 1d., and fix a small cooking stove free; and we find an average slot consumer burns 9000 cubic feet of gas per annum. The difference of 6d. between the prices charged to any ordinary consumer and a prepayment one, we find in our case nearly pays for the rent of the stove and the extra trouble of collection.

On the other hand, the industrial world is using gas for motive power and heating more than ever, and gas-engines are—considering first cost, cheapness of running, repairs, and attention—worthy of the enlarged demand for them as prime movers. It seems strange for a gas company to put down a generator for the supply of electric light; but an increasing number of companies do this, and always successfully. Here we see business instinct, combined with technical ability, utilizing the means at its disposal to meet competition, occasionally of a severe kind. The high efficiency of the gas-engine as now made, makes it possible for a unit of electricity to be generated by a direct-coupled dynamo at less than ¾d. per unit—gas being, say, 2s. 9d. per 1000 cubic feet. Or—including all charges—electricity can be generated for use in shops, warehouses, &c., at under 1d. per unit; and by placing out gas-engines and dynamos, coupled together, as has been done in Derby on the hire-purchase system, trade has been kept, which would otherwise have been lost. This is now of mutual advantage to both buyer and seller.

We have two instructive papers and some important business to follow my address; so I must not take up more of your time. Otherwise, I should have been glad to have advocated the bringing up to date of our rules, the superanuation of gas-workers and officials, and some other matters. But these must wait for a more favourable opportunity.

In terms of high praise, Mr. Cooper moved, and Mr. Fletcher Stevenson (Coventry) seconded, a vote of thanks to the President for his address; and the endorsement of their words by the members was of the heartiest description.

Mr. A. T. Harris (Market Harborough) then read the following paper:—

NOTES ON THE RECONSTRUCTION OF A SMALL GAS-WORKS.

Soon after taking up my appointment here, in January, 1900, I was consulted by the Directors of a small Gas Company in this county, to advise as to the best course to be adopted to place their undertaking in a position to meet the then increasing demand for gas, and to recommend what renewals were necessary, or extensions required, to meet any prospective increase likely to arise during the next few years.

An inspection of the works showed that not only was the plant generally inadequate to meet the demands made upon it, but its condition was such that no addition or improvement could possibly be made to any of the existing apparatus, and that, with the exception of a small gasholder of about 7000 cubic feet capacity, it was absolutely necessary to reconstruct the whole of the works. As the Company had no reserve fund, the Directors decided that the whole cost of reconstruction should be met by raising additional capital. The position was therefore that not only would the new works be required to earn dividends on the amount expended on them, but also on the major portion of the original capital, which account then stood at £2500 for an annual make of about 3 million cubic feet. Owing to the limited area of the ground occupied by the old works, and the difficulty in then obtaining any adjoining land, the question of removing the works to a new site was carefully considered; but as the Directors decided to stick to the old site, relying upon their being able to purchase adjoining land before further extensions than those now contemplated were required, it was necessary that the arrangement of the new plant should be such as not to interfere with the maintenance of the gas supply during the process of reconstruction. Having regard to the small number of consumers in proportion to the population of the district supplied, and the fact of there being no cooking stoves on hire, or prepayment meters in use, there appeared no reason why the consumption could not be considerably increased, if consumers were enabled to obtain a cooker at a nominal rental, and fixed free of cost, combined with the advantage of the introduction of the prepayment meter system. These facts were instrumental in my deciding to advise the Directors to lay down plant capable of meeting a demand of at least 10 million cubic feet per annum. This the Directors decided to do; but as it would probably be some years before this output was reached, I recommended that the retort-stack should consist of such units in the first instance as would deal most economically with the probable demand during the next four or five years. The following is a short description of the buildings and plant erected.

The retort-house and coal-store is a combined building 48 feet long by 30 feet wide, with a height of 17 feet to the top of the stone-pads in the side walls, to which the feet of the principals of the roof are bolted. The roof consists of seven wrought-iron principals with rafters of 3 in. by 3 in. by ⅜ in. T section, and is covered with slates, which are fastened by copper nails to wood lagging secured to the angle-iron purlins. The ventilator extends the full length of the house. The retort-stack consists of three beds with regenerator furnaces, having settings of five, three, and two retorts respectively; provision being made to convert these into settings of six, five, and four without any alteration to the brickwork below the ground-line other than increasing the width of the furnaces in the settings of the three and two retorts, for which special provision is made. The subway is 7 feet wide by 7 feet deep, floor to floor. The retorts are of Ω section, 22 in. by 15 in. by 9 ft. 3 in. long over all, and are fitted with self-sealing mouthpieces and 6-inch ascension pipes.

The hydraulic main, which is of mild steel plates, is 20 in. by 20 in. U section, in three lengths, with separate 6-inch valves and connections to each bed, having suitable saddle-branches to ensure the thick tar running off and leaving a light seal. To the bottom of each saddle-branch is bolted a 2-inch diameter plug-cock, which is connected to the 4-inch tar-main, and enables each hydraulic main to be emptied and flushed with clean water or liquor. Two hand holes, 18 inches long by 6 inches deep, fitted with movable covers, are cut in the back of each hydraulic main, to permit of them being cleaned out or examined as required. The bench-bracing consists of steel joists, H section; the hydraulic main being supported by the cross girders attached to the front and back buckstays.

The foul main consists of about 60 feet run of 8-inch cast-iron pipes, exclusive of the portion immediately in the rear of the hydraulic main.

The condensers are of the annular type, and consist of two columns, each 12 feet high; the diameter of the inner and outer tubes being 1 ft. 10 in., and 2 ft. 8 in. respectively. The 8-inch connections are continued to the outlet of the condensers.

The underground tar and liquor storage tank is 9 feet square by 9 feet deep, and is capable of containing the combined production of tar and liquor from about 110 tons of coal.

The exhauster is of the Beale two-blade type, of 5000 cubic feet per hour capacity, and is coupled direct to a horizontal steam-engine on the same bed-plate. The scrubber is 20 feet high by 3 ft. 6 in. diameter, and is filled with wood boards. A suitable distributor is fixed on the top, through which a constant stream of liquor is supplied from a direct double-acting steam-pump fixed in the exhauster and meter house. The latter is one building, 18 feet long by 12 feet wide. Steam is supplied for driving the exhauster and pump from a vertical boiler 8 ft. 6 in. high by 3 ft. 6 in. diameter, fixed in a corner of the retort-house.

The purifiers are two in number, each 10 feet square by 4 feet deep, with provision in each for four tiers of grids; and they are worked by means of two 6-inch dry-faced valves.

The station meter is of 7000 cubic feet per hour capacity, and is second-hand, having previously been in use at the works.

The new gasholder is 40 feet in diameter by 18 feet deep; space not permitting of a holder of larger diameter being laid down. The guide-framing consists of five steel lattice standards connected together at the top with lattice girders 18 inches deep. The side walls of the tank are constructed of bricks set in cement with puddle backing; the bottom being covered with a layer of puddle 14 inches thick, and one course of bricks laid on edge grouted in cement. The capacity of the holder is about 22,600 cubic feet. The inlet and outlet pipes are 6 inches and 8 inches diameter respectively.

The station governor and connections are 6-inch.

It may be interesting to note here that the whole of the connections to the outlet of the scrubber are above the ground level; cleaning caps being provided at all angles and bends throughout the works.

The total cost of the foregoing amounted to £3890, as per schedule below; but this sum would undoubtedly have been very much reduced had it not been for the high prices then prevailing for materials, together with the extra cost of erecting the plant

in sections, and the large number of temporary connections that had to be made in order to maintain the supply uninterrupted.

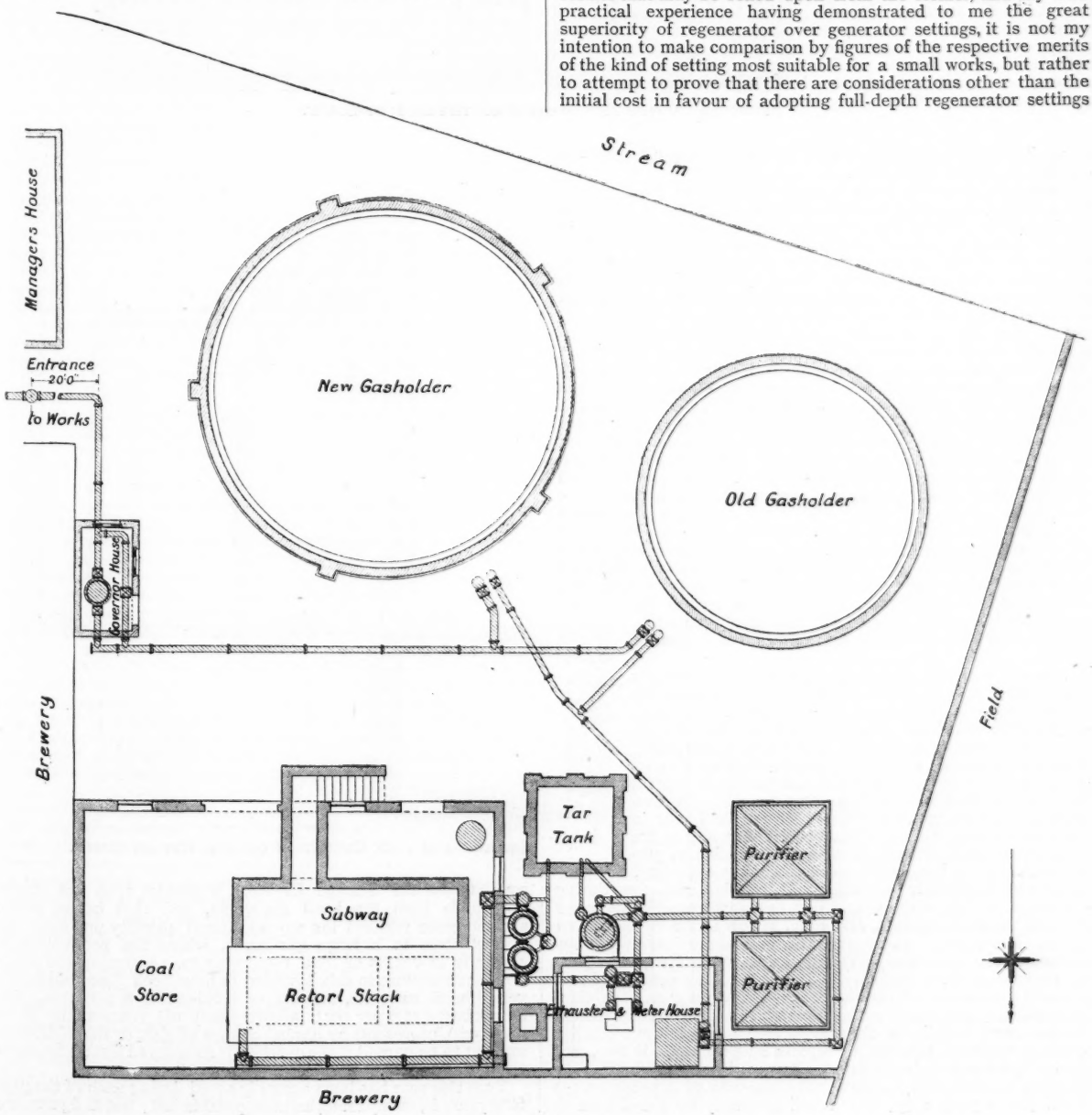
SCHEDULE OF COST.

Retort-house, meter-house, governor-house, chimney, tar and liquor tank, and entrance to subway	£610
Retort-house roof	125
Retort-stack complete	900
Foul-main and condensers	120
Boiler, feed pump, and steam and water connections	110
Steam-engine, exhauster, governor, valves, and connections	137
Double-acting liquor pump and connections	30
Scrubber	135
Purifiers	325
Meter and governor, with valves and connections	98
Gasholder and tank	1,250
Yard connections	50
	£3,890

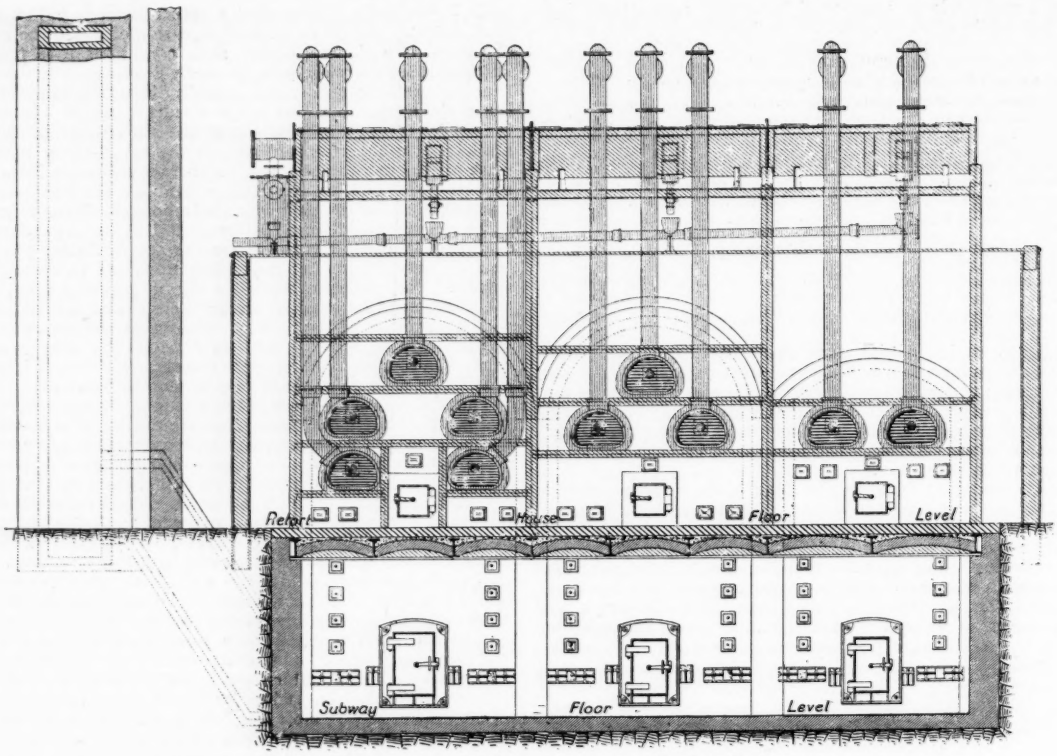
With the exception of the retort-stack, there is nothing that materially differs from the usual type of plant generally laid down in small works; and while inviting criticism on any portion of the plant or its arrangement, it is to the retort-stack that I wish to specially direct your attention. Reference to the plans will, I venture to think, show one or two interesting features—at least, to managers of small works.

It will be seen that between the back of the retort-stack and the retort-house wall there is a space of 3 feet. This serves the two-fold purpose of giving access to the cast-iron pipes built in the retort-backs for scurfing purposes, and also permits of the work of resetting being carried out under much more agreeable conditions than when all the work has to be done from the front of the stack. In small works, this is invariably the case; and owing to the small number of settings, and probably thin division walls, it generally follows that a retort-setter is called upon to reset a bed of retorts on at least one side of which the next bed of retorts is working. Under such conditions it is practically impossible for the work to be properly done, owing to the intense heat and confined space, with a result disastrous, not only to the life of the setting, but also to the results obtained. By carrying the arches through to the back of the stack, and taking out the brickwork in the rear, not only is the retort-setter enabled to work under such conditions as to warrant really good work being expected from him, but the manager is able to exercise that inspection and close supervision which is impossible when the work has to be entirely done from the front, and which supervision is so necessary in a small works where the supply during the time of heaviest demand is often dependent upon one particular bed of retorts. The system of air-pipes also, if properly used, enables the manager of the smallest works to easily and successfully cope with the scurfing of the retorts. The writer has used this system continuously since 1883; and no difficulty has ever been experienced in thoroughly freeing the retorts in about four hours from the carbon accumulations of several months' working.

The total cost of the retort-stack, including the subway, hydraulic mains, valves, and 8-inch connections immediately in the rear of the hydraulic mains, was £900; being an average of £90 per mouthpiece as completed. On first sight, this appears a very excessive amount; but it must be borne in mind, in addition to the high price of materials then prevailing, that for a small expenditure the number of retorts can be increased 50 per cent., and the net cost per mouthpiece brought down to about £65. Bearing in mind the small make of gas, the question will naturally be asked: "Have the results obtained justified the additional expenditure incurred above the cost of shallow-depth regenerator or generator settings?" Not having any particulars by me as to the working results that may be relied upon from the former, and my own practical experience having demonstrated to me the great superiority of regenerator over generator settings, it is not my intention to make comparison by figures of the respective merits of the kind of setting most suitable for a small works, but rather to attempt to prove that there are considerations other than the initial cost in favour of adopting full-depth regenerator settings



PLAN OF THE GAS-WORKS.



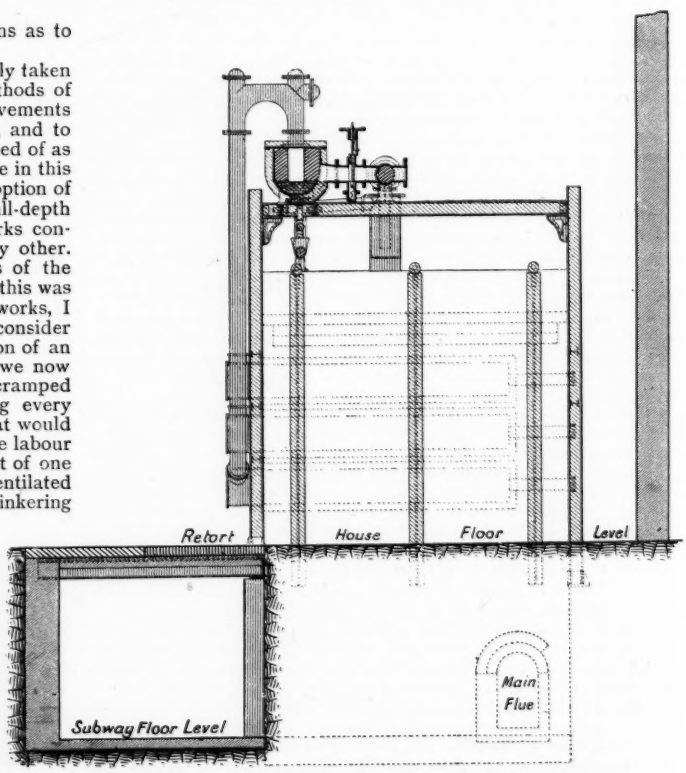
FRONT ELEVATION AND SECTION OF THE RETORT-STACK.

in small works—subject, of course, to the local conditions as to subsoil, &c., being favourable.

During the past few years, a revolution has practically taken place in most large and medium-sized works in the methods of carbonization; one of the primary objects of the improvements effected being to reduce manual labour to a minimum, and to render the conditions under which such work is performed of as favourable a nature as possible. None has tendered more in this direction (machinery and slopers excepted) than the adoption of gaseous firing; and the now almost universal use of full-depth regenerator settings in large and medium-sized gas-works conclusively proves the superiority of this system over any other. Small undertakings are rarely able to avail themselves of the labour-saving appliances seen in larger works; and as this was one of the few principles equally applicable to small works, I decided to adopt it in this instance, preferring rather to consider ease, comfort, and efficiency in working than the question of an increased initial outlay of about £350. How often do we now see in small works comparatively new retort-stacks with cramped chambers and shallow furnaces, necessitating clinkering every few hours under conditions so laborious and trying that would not be tolerated by stokers in large works. Compare the labour of the working manager under such conditions and that of one whose works are equipped with a commodious and well-ventilated subway with full-depth furnaces, which only require clinkering once in 48 hours, and see if the improved results obtained by the latter are not reflected in the balance-sheet to an extent commensurate with the increased outlay.

From a financial aspect alone, I am also strongly of opinion that the advantages of full-depth regenerator settings are relatively equal, if not greater, in a small works than in a large one, provided the retort-stack consists of such units as to deal most economically with the demand. From personal observation of cases which have come under my notice, I venture to express the opinion that it is in this latter direction the consulting engineer, accustomed generally to deal only in large units, often fails to realize the utility as well as the economy of small settings of the highest efficiency, preferring rather to lay down larger units of less efficiency, which cannot possibly be worked to their fullest advantage during the major portion of the year, either as regards productive power or economy in production, and equal in cost to the more efficient plant. The method of comparing the cost of the various systems per mouthpiece is often misleading, inasmuch as the greater productive power of retorts heated with regenerator furnaces reduces *pro ratâ* the number of mouthpieces required for a given production and the initial cost proportionately. Moreover, in addition to the saving in fuel, due not only to the system, but also smaller settings required, the cost of repairs and renewals is less, and space is economized—the latter often an important factor. As to what the monetary saving in coke amounts to depends on the local prices prevailing; but it will generally be found that in small towns the demand for coke is greater than the supply obtainable from the local gas-works, and that better prices are therefore realized for any additional quantity put upon the market than in a large gas-works, where the production is generally in excess of local requirements. Assuming the additional expenditure in this instance to have been £400, which is a very liberal estimate, interest or dividend at 6 per cent., and depreciation at 6 per cent. (allowing only 16½ years as the life of the stack), represents an annual charge of £48, or the additional amount to be earned if the question is considered from a financial point alone.

That this sum has been annually saved during each of the past four years is, to my mind, an undisputable fact; but as figures are



SECTION AND END ELEVATION OF THE RETORT-STACK.

not available for comparison with other systems, I am unable to give reliable data showing the details. The means whereby such saving has been effected are—

1.—Reduction in labour.
2.—Saving in coal, due to increased yield of gas.
3.—Economy in fuel, and consequent saving of coke.
4.—Less wear and tear resulting in a reduced cost for renewals.

Consideration of the above shows what a slight amount has to be saved in each direction to compensate for the increased capital outlay. The following table shows the sale of gas, profits made, &c., during the past seven years. It should be noted that the new retorts commenced working during November, 1900.

Year Ending.	Gas Sold.	Average Selling Price of Gas per 1000 Cubic Feet.	Capital Employed.	Gross Profit.	Per Cent. in Cash on Capital Employed.
	Cubic Feet.	s. d.	£	£ s. d.	£ s. d.
Dec. 31, 1898	2,184,100	4 6	2500	9 9 0	0 7 6
,, ,, 1899	2,618,000	4 8	2500	81 16 3	3 5 5
,, ,, 1900	2,718,400	4 8	2500	77 11 0	3 2 0
,, ,, 1901	3,159,600	4 7	6500	219 10 7	3 7 6
,, ,, 1902	4,209,400	4 3	6500	317 7 5	4 17 7
,, ,, 1903	4,505,300	4 2	6500	458 5 2	7 1 0
,, ,, 1904	5,900,000	4 2	8000	589 12 4	7 7 4

The working results obtained during the past year, using Derbyshire coal only, show a yield of 10,200 cubic feet of gas, and a sale of 6¾ cwt. of coke, per ton of coal carbonized; while a make of 7500 feet per mouthpiece per diem is easily obtainable.

Shortly before commencing the work of reconstruction referred to in these notes, a statement was made by a prominent gas engineer that the additional expenditure incurred in laying down full-depth regenerators was not justified in works making less than 32 million feet per annum. From experience gained in several works making under 16 million feet per annum, in which I have advised and superintended the erection of regenerator settings, and also from the further practical experience in the case under notice, I venture to express the opinion that there is hardly any limit in the smallness of the units to which the principle cannot be profitably applied. The axiom of "Dividends being made in the retort-house" still remains true, and is certainly synonymous with the principle of employing the most efficient means or system to maintain or increase such dividends; the degree of efficiency being more accurately represented by the amount of the balance available to be carried forward to the credit of the profit and loss account than in figures which are not reflected in the balance-sheet. Do not these principles apply equally to small works as to large, both from a monetary and progressive point of view? Is not the manager of the small works entitled to the same consideration in the selection of the most important part of his plant as the engineer applies in his own particular works? And are not the questions of conditions of labour and economy in working as important in a small works as in a large works?

In conclusion, I maintain that the initial cost of retort-stacks in small works should not always form the primary consideration in the principle to be adopted, but that managers and employees of such works are entitled to the same consideration or system applicable to improving the conditions under which they work as is extended to employees in large works.

In asking your indulgence for the incomplete natures of these notes, I would add that I have purposely refrained from making comparison by figures which can only be based on hypothetical results; preferring rather to lay before you a plain statement of financial results obtained in actual working, in an undertaking which, it should be remembered, is loaded with at least 17½ per cent. of unproductive capital.

Discussion.

The PRESIDENT said the paper they had heard was a very instructive one, and would be very useful in the future. He had himself had to do with the remodelling of some dozen or so small works; and he wished that this paper had been read before he had had to do the work. Several things mentioned by the author he should adopt in the future. He could not discuss the paper much; but he agreed almost entirely with every word that was said in it. He thought, however, he should prefer to put as big a subway in small as in large gas-works. The unfortunate thing was they often had water to contend with, and were unable to do this. He was glad to notice Mr. Harris had put in a horizontal engine for the exhauster, instead of a vertical one. He (the President) warned managers against vertical ones. He did not agree with vertical boilers, and thought horizontal ones were much better. As to the purifiers, he should have hesitated to put in only two, and should have preferred three, because when they only had two, while one was off, there was only one to depend upon. But people were not so keen now on having absolutely pure gas as they used to be.

Mr. HARRIS asked the President whether he meant three purifiers of the same capacity.

The PRESIDENT said he did not. He thought he should have put in three for the same cost. He also asked whether Mr. Harris could tell the members the difference between the cost of a steel tank and a brick tank for a holder of the size described.

Thanks were due to the author for having put in the schedule of costs. It was very useful to have these figures before them. Regarding the method of having a pipe through the back of the retort for scurfing, he thought this was admirable; and he hoped to be in the position to adopt it. He considered that the results obtained from these small works for the expenditure of capital was marvellous.

Mr. J. FERGUSON BELL (Derby) said the author had been able to show them how in small works to increase the capital at practically no cost to the Company. He agreed with him in putting in up-to-date economical regenerative furnaces, as they were quite as advantageous as, and probably even more so, in small works, than in large ones, because in small ones they got a good price for the coke. The subway seemed to err on the side of smallness. He should have had a subway right along the retort-house wall, as he thought it was a good thing to give the men plenty of room there. He agreed with the President's remarks with reference to the boiler, believing that a horizontal boiler with plenty of water capacity was much more preferable than a vertical one. The paper showed that managers of small works could modernize them without any cost to the Company. He had been concerned in remodelling a works taken over from the late Mr. Charles Taylor, the make of which was 35 millions a year. The total cost of the retort-house, which was entirely new, and consisted of six beds of regenerative furnaces (48 single retorts) came out to £70 per mouthpiece. This was somewhat lower than Mr. Harris's house; and it was accounted for by the larger number of retorts. The cost was heavier, too, than it would have been, owing to the fact that they had to keep the works going; and it had to be done in three sections. He had taken out the figures as to the work that was being done last year and two years previously. Before the alterations were done, they were making 9700 cubic feet of gas per ton of coal; and now they were producing 10,489 cubic feet. He gave these figures as Mr. Harris was unable to give the corresponding ones. The coke formerly sold was 4·8 cwt. per ton; and last year it was 6·9 cwt.—an increase of 43 per cent. There was also a saving in carbonizing wages. Before the change, the figure was 2·64d. per 1000 cubic feet; and last year 2·3d. Summing this all up, there was a total saving of £334, which would pay 10 per cent. on the capital outlay; and as the money could be easily borrowed at 5 per cent., the saving would pay the interest, and leave 5 per cent. towards the redemption. Therefore this Company had been able to increase their productive power by three times, without practically costing them any more. He had no doubt the paper would be a great encouragement to managers of medium-sized and small works to modernize their plant. The idea of the hole in the back of the retort for scurfing was a good one, and one that he should himself adopt.

Mr. F. J. WARD (Knowle) said, as the Manager of a small works, the paper appealed to him more perhaps than it did to the majority of the members. So far as his knowledge went, it was the first paper (certainly since he had been a member) that had been read before the Association on small works. He could hardly agree with the author in putting in a steam-engine. He (Mr. Ward) was making between 7 and 8 millions; and he adopted a gas-engine. He found, in working out the figures previous to putting it in, that he could drive the exhauster by a gas-engine, at a cost of ½d. per hour; while the cost of a steam-engine would be something like 2d. for fuel and water. Further than this, the steam-engine required constant attention, especially when the boiler was a vertical one, in which case the water required to be often attended to. A horizontal engine and boiler did not have to be attended to so frequently. Then, with regard to the purifiers, he also thought there ought to be three. Working with only one purifier, while one was off, especially when they had to depend upon men filling them, was rather risky. They would find that some of the layers were being practically bye-passed; and they would be relying upon two layers occasionally. If there were three purifiers, they could have two on and one off. He had lately put down a set of three 8 ft. by 12 ft. by 4 ft. 6 in., dry lutes; and his costs came out to under £300. Then he noticed that Mr. Harris was likely to be in a difficulty in regard to holder capacity. The heaviest consumption was 30,000 cubic feet now; and his holder capacity was only 28,000 cubic feet. He fully approved of the space behind the retort-bench. In his own case (he was not responsible for it), there was only about an 18-inch space. He had last summer to put bracings in between the buckstays to prevent the back walls coming out; and he found it was a terrible job getting down an 18-inch space to drill out necessary holes. The author mentioned that the fires wanted cleaning every 48 hours. He had one bed of fours in use, and they had only had to clean this fire twice in a year and eleven months; and this was at a time when they were testing coal, and got in some extraordinary samples.

Mr. FLETCHER STEVENSON (Coventry) said he should like to draw attention to the gross cost of these works. It was not possible to criticize Mr. Harris in any material way, but simply to congratulate him. If they took the cost of a larger works, he believed they would base it, with a works of 1 million cubic feet and upwards a day capacity, possibly on about £40,000. With more machinery put in, as was now the case, it would cost perhaps rather more. If they took this basis (of course, it did not apply to small works), and applied it to works such as Mr. Harris had described, they would cost £2800; whereas Mr. Harris's

came out to £3890. He thought this was most satisfactory to Mr. Harris that it did not cost more than that. Works of this size could hardly be built for less than double, in proportion, the cost of works (say) of 1 million per diem and upwards. They might take it that the author had cut the costs down to the absolute minimum for good work; and this, it should be noticed, included the regenerator settings, which were evidently of the very best description judging from the work got from them. Therefore he said the author had done extremely well with these works. As to the pipe in the back of the retort, he saw that idea a good many years ago, and believed it had been very successful. Mr. Harris had been criticized for putting in two purifiers. The works were intended for extension; and therefore in his (Mr. Stevenson's) opinion, it was far better to put down first two purifiers of fair size, and then two more when they were required, than to put in three or four small ones, which would probably have to be taken out, and be replaced by larger ones, later on. He did not think there was any difficulty in working with two purifiers. He was at one time connected with a small works making 8 or 9 millions a year. There they had only two purifiers; and there was not the slightest difficulty in keeping the gas clean while one was being changed. It must be remembered that these small purifiers did not take one or two days to change. They were done very quickly; and therefore the manager could easily control this, and keep the gas right while changing. As to the question of the steam engine and boiler, it must not be lost sight of that steam was useful on a works for other purposes. A vertical boiler if of good capacity, and given a water not very hard, might be quite as good as a horizontal boiler. Of course, they knew that Cornish and Lancashire or other externally cylindical boilers were the easiest to clean, and most lasting; but a large capacity vertical boiler, with soft water, was as good for all purposes as a horizontal one.

Mr. HARRIS, replying to the discussion, said, as to the question of purifiers, Mr. Stevenson had kindly answered that. He had in view, when putting in the two purifiers, that the time would probably come when extensions would be required. To his mind, small purifiers were one of the biggest bugbears the manager of a small works had to deal with. What was worse than having to change the purifiers two or three times a week in winter, and having to be troubled with back-pressure. There was no fear of bad gas going forward if a test-cock was put in above the second tier of the second purifier. Directly a foul test was obtained there, they could get on to the other box, and so the gas could be kept quite clean. One of the primary reasons which induced him to put in a vertical boiler was that they were very cramped for space. The same applied to adopting a gas-engine. It would have necessitated putting in shafting and pulleys; and this would have taken up a lot of space. From experience, he found that a boiler was a valuable adjunct to small works. In cases of severe frost, it was convenient to have one to run to. The cost of the fuel was almost *nil*, because it was only breeze from the coke. They found no difficulty in keeping the boiler in work during the summer months. Assuming that there was a charge put in at ten o'clock, they would bank up the boiler, and leave the engine and exhauster running for at least four hours, without any attention. As to the subway, he thought a 7 feet square subway (although it did not come up to the 8-feet level as in larger works) was found, in actual practice, to be a comfortable subway to work in. Mr. Bell had given some data as to the cost of works that he had altered. He (Mr. Harris) thought some figures which had guided him in bringing this paper forward would be of interest. In 1898, when at Droitwich, he put down a stack of regenerator settings. Previous to this, their yield of gas was 9500 cubic feet per ton. With the regenerators, it was 10,500 cubic feet. The difference in yield for a make of 15 million cubic feet per annum represented a saving of 150 tons of coal. The 150 tons at 13s. 6d. per ton represented £100. If they deducted the residuals (at 5s. per ton) which they would have had if they had carbonized another 150 tons of coal, this was equal to £37 10s. For wages and maintenance in carbonizing the 150 tons he took 2s. 6d. per ton, or £18 15s., which left a net saving of £81 5s. Then there was the saving in coke—200 tons at 11s., making £110. So that altogether they realized a saving of £191 5s.; the retort-stack costing them £850. At Finedon, in 1901, he erected a similar retort-stack; and he saved there, on an outlay of £900, £159 8s. These figures were really put below the actual saving. With regard to the use of regenerator furnaces at Ashbourne in Derbyshire, in 1899 a new regenerator bed was put in in the place of generators. The yield of gas formerly with the generators was 9900 cubic feet; and the coke sold per ton was 7·34 cwt. With the regenerators, they made 10,700 cubic feet per ton, and had 9·95 cwt. of coke for sale. He might say these results had been obtained now ever since the stack was put up—a matter of five years ago. They resulted in a saving of close upon £200 a year, on an outlay of £900. At Finedon, with a make of only 11 million cubic feet per annum, in the three years the settings had been at work, they had had a coke sale of 9 cwt. per ton of coal; and the yield was 10,700 cubic feet per ton. These results would, he thought, compare favourably with many that were obtained at larger works. At Market Harborough, in 1900, with generators, they carbonized 3700 tons of coal, and made 35,389,000 cubic feet of gas. This worked out to 9564 cubic feet. The coke sold was 1384 tons, or 7·48 cwt. per ton of coal carbonized. In the first year's working of the regenerators, they carbonized 3753 tons of coal, or 53 tons more. The make was 41,100,000 cubic feet; and the average make 10,950 cubic feet per ton of coal. The coke sold amounted to 1921 tons, or 10·23 cwt. per ton of coal carbonized. The saving in coal and coke amounted to £443 4s. on an outlay of £2250. These were not theoretical figures, but the results of actual working. He had been connected with small works for many years; and he could say that the manager of small works in the past, in very many instances, had been unable to get results that he should have been able to do through having plant put down that he ought not to have had to work with. Such managers were, to his mind, entitled to the same plant as the engineer in larger works; and then there was reasonable grounds for expecting the same results.

Mr. S. O. STEPHENSON (Tipton) moved a vote of thanks to Mr. Harris, remarking that the paper showed that great care had been exercised in its preparation.

Mr. FOWLER seconded the motion, and it was heartily agreed to.

Mr. HAROLD E. COPP (West Bromwich) then read the following paper, entitled—

A SUGGESTION FOR INCREASING THE USEFULNESS OF THE MIDLAND ASSOCIATION OF GAS MANAGERS.

I am conscious of the fact that when a member of this Association ventures to present a paper on any subject, he is rightly expected to have something both original and instructive to say. But to-day I cannot claim to have either, and must therefore ask for your kind forbearance while I endeavour to place before you a few thoughts upon a subject which I feel sure will, nevertheless, commend itself to you. Although it may be admitted by some that the mutual benefit to be derived from social intercourse and the opportunities which are presented from time to time of visiting the works controlled by members of this Association would alone be sufficient justification for its existence, it will be universally conceded that its primary function should be that of the collection and dissemination of useful information among its members.

It is necessary that the education of the gas engineer of the present day should be much more comprehensive in character than that which but a few years ago would have served him in good stead; recent progress having greatly increased the numberof subjects with which it is essential he should be more or less familiar. Judging by what we read in our technical papers, I fear this is a matter which has received greater attention at the hands of our brethren on the Continent, and perhaps to some extent in America, than in this country. But it is certainly open to question whether some of our District Associations have supplied an amount of knowledge, especially of these newer subjects, commensurate with the rapid growth of the science of gas engineering in recent years, although there can be no doubt that we are much indebted to our excellent Technical Journals for the way in which they have been the means of remedying the defect by selecting and reproducing articles from all sources.

One frequently hears of the reluctance of members to come forward with papers. I do not profess to be able to state all the reasons for this; in some cases it may be due to their sense of modesty, which might be overcome by a little judicious persuasion. But I suggest there is some reason to fear that, if the subject is an account of the author's work, it may either excite criticism of an unpleasant nature, or that it may be taken at the end of the meeting. Fluency and ability to speak for indefinite periods upon an infinite variety of subjects are not always synonymous with originality and resource; and valuable information is often communicated in the course of conversation after a meeting which would have been much appreciated by members generally if the communicant could have been induced to bring it forward during the meeting. Statements which are straightforward, unvarnished, and to the point, even if scrappy, should certainly meet with a kindly reception by all members of this Association.

In spite of the keen competition of electricity for lighting and motive power, we have recently observed with much gratification the increase in the prosperity of the industry we represent, which, in the opinion of many, has almost attained to its zenith—at any rate, so far as lighting is concerned. But whether this be so or not (and I for one do not believe it), we may be certain that in the future even greater efforts will have to be exerted in order to meet competition successfully than have hitherto been put forth in bringing the industry to its present high state of prosperity. It is therefore with all diffidence that I venture to question whether this Association could not extend its field of usefulness.

On looking through the proceedings of kindred Associations, it is observed that perhaps with the exception of subjects dealing with the prepayment meter, those directly connected with the manufacture of gas have come in for by far the greatest share of attention. Although this is in no wise to be regretted, yet some of the recent discussions on questions such as inclined *v.* horizontal retorts, or the prevention of naphthalene, might lead one to believe that something of the spirit of modern party politics has been infused into the proceedings of some of our Associations. Surely one of the great results to be accomplished by the mutual intercourse afforded by such Associations is that of widening the views of their members, and thus breaking down the natural tendency to think in grooves on certain subjects, whereby the engineer commits himself to one line of action, the consequences of which, even if open to question, it is natural that he should seek to justify, and it is often that the value of papers suffers in the process.

Notable achievements have doubtless been recorded in connection with gas manufacture; yet it is equally certain that the utilization of gas as an illuminant and motive agent has not received an amount of attention corresponding with that of our competitor electricity, although the recent exhibition at Earl's Court has undoubtedly acted in some quarters as an excellent and timely stimulus. Truly we live in an inventive age; and the industry which we represent has come in for its full share of the products, good, bad, and indifferent. In passing, may I express the hope that the Act which has recently come into force will tend to encourage patentees of the really practicable and useful articles, provided they are prepared from time to time to bring their productions in line with the rapid developments of the times, instead of stimulating what seems to be the existing policy of "making hay while the sun shines." But I am afraid that, although it will probably lessen the vexatious litigation to which inventors are at present subject, there will be no corresponding benefits for the user.

Some of us in towns where the competition with electricity is keenest are constantly being informed of the cleanliness and convenience attending its use. Although some are prepared to admit the superior lighting power of gas, it is our duty to use all reasonable means to remove the prejudice which still largely prevails. It is also a notorious fact that until recently our rivals enjoyed what was almost a monopoly in artistic and inexpensive fittings; but, thanks to the enterprise of some of our leading manufacturers, and the advent of the inverted burner, our position in this respect has been much improved of late. The difficulties of uncleanliness and inconvenience can also be largely overcome—the former by the judicious selection of a burner suited to the gas it is required to consume, and the latter by the use of either a pneumatic or electric switch, suitably arranged at the door of each room. It is well known that the limits between which an inverted burner will work successfully are much narrower than in the case of one of the ordinary type. I have found that, in order to obtain the best results from an inverted burner, the flame, before the mantle is placed in position, should not be perfectly atmospheric, in the usual sense of the term, so that the combustion may be completed on the surface of the mantle by means of a liberal supply of external air. This object is more perfectly accomplished by using a comparatively close-fitting bulb, instead of the large globe generally sold for these burners. On the other hand, if the air supply is insufficient, the very disagreeable odour of partially burnt gas is produced.

I need hardly say that imperfectly developed inventions can only have a detrimental effect at what is without a doubt a somewhat critical, even if prosperous, period in the history of the gas industry, and should be discouraged by all that lies in our power. At the same time, some of these inventions embody excellent ideas, and with slight modifications, which might be suggested by any experienced man, could be made both practicable and profitable apparatus. It has been stated that the inverted burner is in principle a contravention of one of the laws of nature. It may be in theory, but I do not believe it is in practice, having on several occasions observed, without the aid of a reflector, an illuminating power of over 23 candles per cubic foot of gas consumed per hour, at the angle of maximum illumination (usually about 30 degrees with the horizontal). This seems to me to show that, owing to the facilities it offers for pre-heating the gas and air, it will play an important part in gas lighting of the future.

At least two District Associations have apparently recognized the necessity of attempting some work of a more practical character than the mere reading and discussion of papers. For instance, the Manchester District Institution of Gas Engineers have taken in hand the commercial side, and have long had in operation an organization having for its object the more advantageous disposal of residuals without attempting to artificially inflate market prices; and the Southern District Association of Gas Managers are also making a thoroughly practical attempt to solve the problems connected with the causes and removal of naphthalene. While not seeking to impose upon this Association so formidable, and in the light of recent events so thankless, a task, I nevertheless venture to think that there still remains a task for this Association, which, if my suggestion commends itself to your favour, and is carried out upon sound lines, may prove in its results to be beneficial not only to the members of the Association, but indirectly to the gas industry.

We have recently heard much about the American "Question Box," and of an attempt to introduce it to British gas engineers. Although some such organization among our own Association might be advantageous, I do not believe it could be worked satisfactorily on anything approaching an international scale; for besides the great diversity of interests and conditions, replies to questions embodying the results of scientific experiments lose much of their value unless the author is quoted, and accurate records of his methods are available. I would, however, go even further than this as regards our own Association, and suggest the formation of what, for want of a more suitable name, I will call a Technical Investigation Committee—membership of which might be conferred upon members of the Association who, by their known attainments, impartiality, and the resources at their command, are best qualified to investigate the various questions which arise from time to time, and whose duty it would be either to submit their conclusions at the meetings, or to communicate privately with those requiring information according to the nature of the subject of the inquiry. Membership of such a Committee would doubtless in course of time be regarded as being no inconsiderable distinction.

I will endeavour to show how the services of the Committee might be so directed that the results would have the desired effect, and, with this object in view, will take the subjects already touched upon, although many more will doubtless suggest themselves to older and more experienced members than myself.

First, with regard to the reading of papers. The Committee might profitably select subjects on which it would be desirable to obtain papers. Notwithstanding the fact that the Midland Association has not recently been treated with accounts of any remarkable working results, we nevertheless read from time to time of accomplishments in carbonization—generally with the assistance of some extraneous process—which are calculated to fill the breasts of even the ablest engineers with envy. Take, for instance, the admixture of blue water gas and coal gas, before which I think there is an important future when our present methods of carbonization are modified. But I do not believe in the possibility of getting more out of a retort than one puts in. There can be no doubt that a strict and impartial investigation of this subject would be of the utmost benefit to gas engineers, and could but reflect credit on those possessing the intelligence and forethought enabling them to achieve results in advance of their brethren.

The question of the economical generation of power by means of gas-engines, and the variously named producer gases or suction gas plants, is also one that demands our immediate attention; for we see it stated in the advertisement columns of the Technical Journals that, by the latter, units of 5-horse power and upwards will develop power at the remarkably low rate of $\frac{1}{10}$d. per horse power per hour. If this is so, of course, one of the most important sources of gas consumption is doomed; and no time should be lost in ascertaining at what price it is necessary to supply gas to compete with these modern developments, having due regard to cost of working, maintenance, interest on capital outlay, &c. Then with regard to the host of inventions relating to lighting appliances, to which I have already referred. If every engineer determined to purchase, for testing purposes, one specimen of each showing any promise of success, it would be a serious tax upon the time and resources of many, and especially those who have not the advantage of the services of assistants competent to engage in such work. And it must further be remembered that many have not at their command the somewhat expensive apparatus necessary for its accurate performance.

It can be understood that after very considerable trouble and expense has been incurred by a manufacturer in reducing the production of his specialities to a system, he is naturally somewhat reluctant to modify that system, even if he can see that a marked improvement in the articles would result; and although he be unwilling to meet the request of several individual engineers, he may favourably consider the question when backed by the influence of a Committee representing this Association, to the benefit of all concerned. As an instance, I may mention the difficulty of obtaining really effective glass-ware for inverted burners at reasonable prices. Imitation is said to be the sincerest form of flattery—not that we wish particularly to flatter our competitors; but, at the same time, we must certainly give full consideration to the popular taste. One of the chief recommendations of the inverted burner is its resemblance in appearance to the electric light, and, consequently, its suitability for producing decorative lighting effects; and although there is at present glass-ware for this type of burner of almost all shapes, sizes, and colours, most seem to be designed for the special purpose of destroying the desired effect.

Difficulties also often arise with gas consumers owing to statements placed before them by canvassers for electric lighting and power, whose arguments are sometimes not easy, even for experts, to follow; and I think that such a Committee could render very material assistance to those whose experience in these matters is limited. The Committee might reserve to themselves the right of refusing to deal with questions which, in their opinion, were either irrevalent or indiscreet; but I think that generally the choice of questions might safely be left to the discretion of the members of the Association. I would not, of course, suggest that advice on all the matters mentioned should be placed at the indiscrimate disposal of members, and in due course become public property; yet I think if an organization on the lines I have indicated were started to enable members to avail themselves of the benefit of an opinion on any new or other apparatus which they themselves have had no opportunity of testing, it would be found a great advantage to many.

Although fully cognizant of the difficulties which must naturally be encountered in order to carry the suggestion into effect, I strongly feel the necessity of attempting something in this direction, and venture to think that the attempt would not place too severe a strain upon the *esprit de corps* which undoubtedly exists among the members of this Association.

Discussion.

The PRESIDENT said he was sure they had heard a very able paper by Mr. Copp; and there were many things in it which were almost similar to matters referred to in his own address. He did not know whether the members were aware that Mr. Copp was the first in the profession, perhaps in the world, to bring into practical use the invention for switching on gas similarly to the electric light by a push-ball. As to the paper, the point about the suction-gas plant appeared to be a startling one. The Borough

Surveyor of Leamington had been investigating this matter for the Water Committee; and he reported that he could make gas for the use of a gas-engine at the pumping-station for 2d. per 1000 cubic feet. But 1000 cubic feet of the Leamington ordinary gas was equal to about 4000 cubic feet of the suction-producer gas; so this would make the suction gas equal to 8d. per 1000 cubic feet. They were charging the Committee 2s. 5d. per 1000 cubic feet; and unfortunately they were not in a position to make any reduction, because in the Company's Act of Parliament, they were bound to charge the public lamps at the lowest prices they were selling gas at. Although they might have been in a position to sell gas to the Water Committee for their engine at 2s., they could not come down to that price for all the public lamps. The fact was the Water Committee could make gas equal, for their purposes, to 17-candle power gas at 8d. per 1000 cubic feet. This he regarded as a serious thing; and it wanted to be very carefully investigated.

Mr. J. H. Brown (Nottingham) said he thanked Mr. Copp for the interesting paper they had had that afternoon; and he thought the suggestion of the author was one that it was worth while the Association taking up. The paper, however, and the remarks that Mr. Copp had added to it, covered a very wide field indeed; and one had great difficulty in selecting any particular matters for criticism. There were, however, two points in the paper on which he should like to speak. Mr. Copp said that the gas industry was never more prosperous than it was to-day. There were few of them who would not agree entirely with his remarks in this direction. So far as his (Mr. Brown's) memory served, he did not know of any period in which gas undertakings were in better condition. But there was another aspect of this matter to which they should give consideration in conjunction with what Mr. Copp said. It was this, that he had never known a period when they were subjected to such severe competition in every direction. They had now very formidable competitors in electricity, oil, and acetylene; and they had a still more active competitor in the power-gas business. With this power gas, or producer gas, they were, in some cases, beaten on their own ground; and everyone who had gone into the question, and studied the efficiency of these producers, must admit that in producer gas they had a serious competitor, and particularly in the suction gas form. When, some eighteen months ago, one of the power gas corporations started to exhibit these plants in a show-room in Nottingham, he went into the question; and he found that it practically meant, if these plants would do what was claimed for them, that the Gas Department would, in all probability, lose consumers taking between 200 and 300 million cubic feet of gas per annum. He put the matter before the Gas Committee, and pointed out what a serious thing this was, seeing that if the suction plants proved their claims it would, in addition, take away a large amount of the day-load of the gas undertaking. The Committee instructed him to get out the highest prices at which they could sell gas to compete successfully with these suction plants; and they, upon his report, reduced the price to 1s. 6d. for power gas purposes to consumers taking over ½ million cubic feet per annum. The result was they had not one suction plant now at work in the town. The ordinary price of gas was 2s. 6d. per 1000 cubic feet; but still he should be quite prepared to take on another 300 million cubic feet for power purposes at the same rate of 1s. 6d. per 1000 cubic feet. Then with regard to the efficiency of the Mond gas. The Company promised to supply 10-horse power per hour for 1d., which was considerably cheaper than they could supply coal gas at; and it would be found, on investigation, that the efficiency per British thermal unit was greater than in the case of their own supply. They were supposed to have gas of four times the calorific power of the Mond gas; but the efficiency in the gas-engine was not more than 2¾ to 3¼ the efficiency of Mond gas. The efficiency of blue water gas was for lighting purposes with the incandescent mantle higher than the efficiency of ordinary coal gas; and for ordinary cooking or heating purposes, there was nothing between them—water gas was equally as efficient as coal gas. "The Man in the Street" therefore said: "If this *very low-grade gas* is so much more efficient, why do you make 16 or 17 candle coal gas?" The obvious thing, surely, was to adopt a lower candle power. They had now two schools or classes of very extreme advocates. First, there were those who supplied this high-candle power gas—something between 17 and 20 candle power; and by doing so they unconsciously were preventing their consumers adopting the most economical means (incandescent burners) of consuming their gas. Then they had the newer school, who also unwittingly compelled their consumers to adopt the incandescent burner by the abnormally low candle power of the gas they supplied. Of the two, he (Mr. Brown) preferred the latter; and, looking at the matter from a common-sense point of view, what prevented them from supplying this lower quality of gas? Simply because a small proportion of the consumers would not use incandescent burners. That, and that only, was what prevented them supplying 6, 7, 8, or 9 candle power gas. The burner would have to be found that would make a real substitute for the flat-flame burner, and there existed a real need of such a cheap and reliable burner for exposed positions, and with which they would be satisfied with an efficiency of from 3 to 4 candles per cubic foot. Then Mr. Copp had spoken on another matter on which he (Mr. Brown) could speak more freely. This was the question of blue-water gas. The author had spoken of the excellent results that could be obtained by people using this process in conjunction with coal-gas retorts. Of some of the published results, he (Mr. Brown) was bound to admit he was rather sceptical; and he could not accept them as they had been presented. His more recent experience had been somewhat contradictory. If these results were accurate, what was the gas industry doing that they did not take up this system wholesale? It was perfectly obvious that, if these results could be obtained, they would all have adopted the system. This was his point in connection with Mr. Copp's paper. These were questions of great importance, and questions which the Association could well take up with very great benefit to the Association and to the gas industry at large. But—and this was the major point—it should not be undertaken unless it was carried out thoroughly. It was no use publishing the results obtained on small works, unless they had every facility for making complete and accurate tests, because he had found from experience that such results were very misleading. In his own case, he experimented with blue water gas at Ilford with the plant then at his disposal; and he obtained what he believed to be accurate results. Since then he had come to the conclusion that these results were some of them most misleading, and that the figures that had been published—particularly the Sydenham figures, showing a gain of 30 per cent. in the sperm value with ordinary coals—he could not by any means attain. It would be found, if examined, that these figures were based on a certain yield per ton for coal gas alone. This was where the error had crept in. They were based on a yield of say 10,600 cubic feet per ton. The question was, Is this the utmost that this particular coal will yield? He had been going into this matter for the last eighteen months; and had been continuously experimenting with plant perfectly adapted for experimental work. They had gone into the matter as thoroughly as it was possible to do. They had been searching for the truth. The results had been prepared in such a form as to avoid any possibility of doubt respecting the accuracy of the figures. They had taken the calorific power, and specific gravity, and had made a complete analysis of the crude and purified gases to see whether they did get (as Mr. Copp put it) more out of the retort than had been put into it. They avoided this at Nottingham by giving a complete analysis from a sample drawn continuously at a uniform rate throughout the 24 hours, and by measuring the coal and water gas. He would like to give the members just a rough outline of some of the figures obtained showing in direct contradiction of Mr. Copp's statement that they did get out of the retort in the way of pounds of sperm per ton of coal carbonized, a greater yield than with the coal gas unmixed with water gas.

Days.	First.	Second.	Third.	Fourth, with Water Gas.
Total mixed gases per ton	—	—	—	14,023
Coal gas alone, cubic feet	11,422	11,007	10,942	11,026
Illuminating power, candles	18·70	20·08	20·37	17·45
Pounds of sperm per ton	732	757	764	837
Calorific power (gross and net)	717/648	738/666	719/648	704/640

They had at Nottingham a retort-house containing twelve beds of sevens, from which they could separate any one bed, and take the gases from it to a most complete testing plant. His Committee had allowed him to take a house immediately outside the works where he put up his assistants, each of them capable and experienced chemists; and for some time past he had been experimenting in a most exhaustive manner. Results had been obtained which would greatly influence the future policy of the department; and he was sure that he had been well repaid for the trouble and expense incurred. He sincerely hoped that this Association would appoint an Investigation Committee as suggested by Mr. Copp; and if they did so, he would be most willing to give them all assistance in his power.

Mr. J. Ferguson Bell (Derby) thought Mr. Brown was rather pessimistic. He told them he had reduced the price of his gas to 1s. 6d. per 1000 cubic feet for power purposes; and it said something for the policy adopted at Nottingham that there was not a single suction producer in the town. With regard to what Mr. Copp called power competition generally, he noticed that electric corporations and local authorities were selling current at 1¼d. per unit which cost them 2⅛d. to produce. He could tell the members an experience with power gas. At Derby some two years ago, a producer-gas plant was put down to work a 100 and a 75 horse power engine. The plant had been in use for about two years; and only some two or three weeks since the gentleman in whose works the plant was came to him and said he had hardly had a night's sleep since he had introduced it, that he was prepared to do away with it, and to take his (Mr. Bell's) Company's gas. The Company had decided to extend their mains for the purpose; and the works in question had guaranteed to the Company a consumption of 20 million cubic feet of gas, and had arranged to do away with the producer-gas plant. In the "Journal" for Feb. 21, the members would have seen a description of a 250-horse power gas-engine; and it might interest them to know that this engine was for Derby, and was going to be run with ordinary coal gas of the Derby Gas Company. He believed that the engine was going to be followed by another one at the same works. Gas companies must sell their gas at anything from 2s. to 1s. 6d.; and they would then be able to compete with Mond, suction, or any other kind of producer gas. He believed that for small powers 2s. per 1000 cubic feet would be a price that would compete well; but for large powers they would have to come down further in price. Mr. Copp had given them $\frac{1}{10}$d. for running with

suction-gas plant. This was the figure quoted by the people who made these plants; but he contended that they only half stated the case. He believed it only included the cost of the coal; and the cost of the coal was only a small factor. They had to take into consideration the men's time in attending to the plant, in removing the clinkers, and all that kind of thing; and, besides these extra items of expense, they had to consider that the coal gas would give 25 per cent. more power with same size of engine than when working with producer gas. The calorific power of the gas made by producers varied very considerably; and he did not think he was over-stating the fact when he said that coal gas had five to six times the calorific value that producer gas had, because the latter varied so considerably, whereas coal gas was practically constant. With coal gas at 1s. 6d. per 1000 cubic feet, used in a 100-horse power engine, any gas company would be able to supply at $\frac{1}{8}$d. per brake horse power per hour; and he did not think any maker of suction plant or producer-gas plant would be able to guarantee so low a cost when the whole of the expenses were taken into consideration. He thought the matter of a Committee for Investigation was one that should be carried out by the parent Institution. In their own case, they might form a Junior Association. He believed that two years or so ago Mr. Corbet Woodall mentioned the question of the Institution of Gas Engineers doing something of the kind; and he (Mr. Bell) certainly thought the matter was more one for the parent Institution than for the Midland Association.

Mr. H. FOWLER (Derby) said he should like to corroborate what Mr. Copp had said as to $\frac{1}{10}$d. per horse power hour being about the price which, he believed, a suction-gas plant could be satisfactorily worked for. About eighteen months ago, he (Mr. Fowler) was instrumental in getting one of these plants put down in this country; and he had an opportunity twelve months ago of thoroughly testing the plant. In fact, he took charge of it for two or three days. He started it up in the morning, weighed the coal in, took samples of the gas as carefully as possible, tested the calorific value, indicated the engine, and had the gas analyzed. He had not the figures by him; but with regard to calorific power, they bore out that it was about one-quarter that of coal gas, and the price with anthracite nuts in the Midlands came out to about $\frac{1}{10}$d. per indicated horse power hour. The man who attended to the gas-engine worked generally in the shop, and did all the odd jobs which it was necessary to have someone to perform. With Mr. Bell, he was sorry Mr. Copp had not raised the question of a Junior Association, because he (Mr. Fowler) thought if the author had confined his attention more to the question of the training of their assistants, it would have been more within the scope, and in keeping with the objects, of the Association, than dealing as he proposed to do with such large questions as those mentioned. He was very much struck with what Mr. Simmance said recently in the "JOURNAL" * as to the few gas students who visited the photometrical demonstrations at York Mansions. He stated the fact that there were only two or three, and two of them he (Mr. Fowler) was pleased to say were from the works with which he was connected. At the Gas Exhibition, there was also a lack of young men visitors. In his opinion, anything they could do for these young men should be done. There were few professions in which the young men were more in earnest than in the gas profession; and their energies should be directed in the right way. Speaking as a consumer of gas, he also thought another subject worthy of their consideration—with regard to the utilization of gas after the consumer got hold of it.

Mr. W. LANGFORD (Longton) pointed out that Mr. Copp said that, by passing blue water gas through his retorts, he could not get out of the retorts more than he put in. This being so, he (Mr. Langford) could not understand Mr. Brown's remarks with reference to the increase in the illuminating power by the process he had adopted. This seemed to him to be a point that should be confided to the care of the Investigation Committee that Mr. Copp contended for in his paper. He remembered Mr. James Helps, of Croydon, recommending the establishment of experimental gas-works. He (Mr. Langford) was inclined to think that the Committee that was suggested by Mr. Copp was even preferable to the experimental gas-works, because if they had this Investigation Committee, they could, he thought, work together, and experiment upon the same problems. Notes could then be compared, and thereby they could come to an amicable settlement of many of the questions at present in dispute. For instance, there was that one which occurred in connection with this Association some two or three years ago, as to which was the cheaper to work—horizontal or inclined retorts. This was a question that had never been settled. Then there was the matter raised by Mr. Copp as to the inverted burner. But he supposed he must speak with bated breath on this point, as he had to work the electric light in conjunction with gas. He did not think they had much to fear from electric lighting; and when they looked round the room in which they were assembled, and saw there was more than a unit of electricity being used there per hour, he thought they would say that they could do that lighting much cheaper and better with inverted burners or other improved incandescent burners. He strongly urged the desirability of the Investigation Committee.

Mr. S. O. STEPHENSON (Tipton) said, while he did not wish to depart from the title of the paper, a challenge was thrown out by the author which almost tempted it. He (Mr. Stephenson) was one of those who had made experiments with blue water gas passing through coal-gas retorts, and Mr. Copp and himself had had many talks over the system. They agreed mostly, and saw eye to eye in the matter. The author stated generally that they could not get an increase all round when water gas was being passed through the retorts. Of course they could not. He (Mr. Stephenson) had never claimed it. But "what he had said, he had said." (Laughter.)

Mr. COPP said he had not insinuated that Mr. Stephenson had claimed it.

Mr. STEPHENSON (continuing) said, if they were going to get an increased yield from the coal by passing water gas through the retorts, then they got a reduction of illuminating power and of calorific power. And these were two points he was inclined to look upon as drawbacks—particularly the latter. He did not think it was advisable to reduce the calorific power of the gas; and, as to the illuminating power, although there were many advocates of low illuminating power, he knew there was a limit to that. He did not believe in going below 15 candles. In getting these increased yields, they only got an illuminating power of 12 to 13 candles; and this was brought up with benzol to 15 candles. Now he did not think that gas of 15 candles with the aid of benzol was as good as 15-candle power gas from the retorts. Mr. Copp was called upon to supply a gas of 17-candle power at West Bromwich; and, under the circumstances, with his use of blue water gas, he certainly would not get an increased yield of gas. He could not do it. The idea of there being any mystery in getting an increased yield of gas from coal, did not say they were all getting the maximum amount of gas they could realize from the coal. Mr. George Helps had felt that he could get an increased yield; and he thought he claimed that he was getting it. At Nuneaton, Mr. Helps had gone in practically for a dry main, as they had done at Tipton; and it was possible to get up to 12,000 cubic feet per ton of coal, provided they could get the coal that would give it. (Laughter.) He would not like to do it with any coal; but if they got a good Yorkshire or other high-class coal, it was possible to do it. He thought the Investigation Committee was an excellent idea.

Mr. GEORGE HELPS (Nuneaton) said there was no question that the difficulties of meeting competition were becoming every day more keen. Mr. Bell had mentioned 1¼d. per unit for electricity. At Nuneaton, they had the "audacity" to sell electricity at ⅞d. per unit for power and for power and lighting at just a little over 1d. Most of the members knew what this meant. The question of competition by suction producer plants had also been remarked upon; and there was no question that gas for power would have to be brought down to a very low figure indeed. The price of 1s. 6d. and 2s. had been mentioned, and they would now have to consider talking about a little lower than that. At Nuneaton they had already had to drop 1s. in order to meet this competition; and there was precious little profit in it. If they looked into the differences that the standing charges made on the cost of gas, it was an important matter. If they were going to lose consumption, it was, of course, going to put up the standing charges; but if supplying at a low price was going to increase the consumption for power, and they could get a trifle over what it cost net into the holder, they would have to be satisfied until improved processes were introduced to cheapen manufacture. He was interested in hearing what Mr. Brown had had to say with regard to the efficiency of ordinary coal gas and producer gas. Mr. Brown said that the former had only about 2¾ to 3 times the efficiency of the latter, although the calorific value was about as 4 to 1. He had been experimenting in this direction himself; and he could say that the efficiency of coal gas was not as 4 to 1, the efficiency not appearing to be quite in proportion to the calories. Much had been said about taking something out of the retort that was not put into it. It sounded a little absurd to speak of making more gas from the same coal per ton by using water gas; but he thought there was an answer to it. He had been interested in trying to discover where the best makes were. This had brought him to the conclusion that a lot of the difference in their operations—in mixing and so on—was accounted for by something going on in the retort that they did not take notice of. They knew that retorts contained cracks and sometimes even holes; and sometimes they got gas coming from the coke in the producer. He did not think there was any doubt about that. They had to look at the effect of the producer gas or the air that got into the retorts in destroying the hydrocarbons. He could quite understand that from the same coal a manager could get a different value, so much depended on the condition of the retorts. He had never seen retorts in such condition as these at Cheltenham, and he had been unable to discover another make to equal that of Mr. Paterson (when the illuminating power was taken into consideration) in any part of the Kingdom. He did not think Mr. Bell was right that coal gas had five to six times the calorific value of producer gas; he wished it had. He did not know of coal gas being supplied at 800 or 900 British thermal units. He took it that Mr. Copp would like a Committee formed to consider these various technical subjects from among those best able to consider them. He would propose that the matter be left to the consideration of the General Committee. Personally, he thought the idea an excellent one, and one calculated to stimulate the energy of every member of the Association.

Mr. B. W. SMITH (Walsall) said the members had been very

* See "JOURNAL," Dec. 13, p. 853.

interested in the speeches that had been made. True, some of them had been rather wide of the mark; but Mr. Copp's paper had evoked an enormous amount of discussion. and had been useful in that way. He agreed with the remarks made by Mr. Copp in the paper, and with the suggestion of Mr. Helps. If the matter was only considered quietly, it would be seen that there would be more reason for them to go thoroughly into the matter, and clear up the points which had been raised—even that of the enormous makes. Whether the gas emanated from the furnace, whether it came from the producer, or whether it came from the coal, it would be very useful if they could only find out definitely where it did come from. It would give a lot of satisfaction to those people who were unable to get the results which were presented to them in one form or another. He had pleasure in seconding Mr. Helps's motion.

The PRESIDENT said, with the permission of Mr. Helps, the resolution he would put to the meeting would be—

That the consideration of a Technical Investigation Committee be referred to the Association's ordinary Committee, with the addition of Mr. Brown, of Nottingham, and Mr. Smith, of Walsall.

Mr. C. MEIKLEJOHN (Rugby) said he did not gather from the paper that Mr. Copp had read that it was altogether a Technical Investigation Committee to which he alluded. It appeared to him (Mr. Meiklejohn) that a Committee of Reference was more what was intended than a Committee of Investigation, though they might combine the two. Mr. Fowler had referred to the question of a Junior Association. He was free to confess that Mr. Fowler and other members of the Association might be more interested in posterity than he was himself. (Laughter.) He believed, too, there were other members who probably based their interest more on their ancestry. (Renewed laughter.) Personally, he was more anxious that they should do something for the living members of the industry, and therefore for present members of the Association. He took it from Mr. Copp's paper that there were other matters which might present difficulties to the members of the Association, and which might be referred to the Committee, and would save them a great deal of personal work and investigation, and give results obtained at works where they had the means of determining such questions.

Mr. COPP, in replying to the discussion, said the title of his paper expressed what he wanted to say; and if it was only for the mere fact that the paper had produced a valuable discussion, he was well rewarded in that alone. Mr. Brown had referred to the cost of generating power by means of producer gas at $\frac{1}{10}$d. The cost of gas in the town with which he (Mr. Copp) was connected—the lowest price for power purposes—was 1s. 5d. per 1000 cubic feet; and he had found, from his various investigations, that this was equivalent to something under $\frac{1}{9}$d. per indicated horse power per hour. This was for engines of anything about 20-horse power. Then Mr. Brown said that water gas was equally efficient for incandescent burners as coal gas. He could not agree with him there. Although he had found that they could get more light from an incandescent burner worked with blue water gas, they had to consider the increased quantity of the gas used to obtain that light. There was not much margin, but still there was a slight margin then in favour of blue water gas. Mr. Brown also spoke of supplying 6 or 8 candle power gas. He (Mr. Copp) agreed with him there. He believed the time would come—when they had discoverad how to make 6, 7, or 8 candle gas profitably, or a mixture profitably of coal and water gas—when it would be supplied. He said "profitably," because with the admixture of blue water gas or any gas without any illuminating power, the illuminating power deteriorated rapidly for a given percentage or a given mixture. With regard to this question of getting more out of the retort than was put in, he did not mean any insinuation at all in respect to Mr. Stephenson. He found in their coal tar they had not more than 2½ per cent. of toluol and benzol mixed; so that they did not lose much that way. And they got the same—practically the same—amount of toluol and benzol if they were putting blue water gas through the retorts; they were getting practically the same amount of benzol in the tar when putting the water gas through the retorts as when putting the water gas through the condensers. There was one question he should like to raise with regard to the admixture of water gas. He did not see there was any particular use in quoting the increased yield of gas per ton of coal. A man put in so much water gas into the retorts; and he said "My yield of gas is now (say) 13,000 cubic feet per ton." He (Mr. Copp) did not believe in stating it in this way, because it was rather apt to be misleading. The next question one would naturally ask was, "What is your production of water gas per ton of coke after you have done this?" Of course, anyone could make as much gas per ton as he liked, but at the expense of the water gas. Then as to the testing of burners. The Special Committee could investigate all the various burners, and report the results obtained. He did not think this part of the Committee's work would be very formidable. It had also been remarked that it would not do to reduce the calorific power of their gas in any way. He quite agreed. But that was just the point. Directly they put blue water gas into the coal gas (it did not matter where they mixed it), they would get a reduction of the calorific power. The quantity of benzol required to raise the mixture of gas by 2½ candles would only give 20 British thermal units, so that they must not look to benzol to bring back the calorific power when mixing coal gas with water gas. The method he was trying now was to do part of the enrichment with oil like that used for carburetted water gas—Solar distillate, or Russian petroleum residue. This, he found, would supply a much greater heating value in proportion to the increase in illuminating power than benzol. Benzol was good for aiding illuminating power, but not for aiding heating value. As to electricity, he had to compete against 0·78d. for street lighting and 2½d. for ordinary lighting, and 1d. for power. The result was a good many people used electric motors for generating their power for 1d. per unit and therefore got their current for lighting at 1¼d.

The motion was unanimously carried, and a vote of thanks was passed to Mr. Copp.

THE QUESTION-BOX.

Mr. GEORGE HELPS said he would not keep the members more than a minute on the subject of the American Question-Box. Most of the members would have received two pamphlets containing a hundred or two questions on all kinds of subjects. Many of these would be found most difficult to answer, and of little practical use when answered. He must admit that he did not quite understand the manner in which it was suggested on the other side of the water that these questions were to be dealt with. The pamphlets he had referred to he might say did not appeal to him; but in connection with the same movement, he had received from Dr. Harrop, of the Milwaukee Gas Company, a series of questions which he (Mr. Helps) considered came under a very different category to those in the pamphlets, and were of a very interesting nature—everyone of them. Dr. Harrop referred to them as questions for the "revision," whatever that meant, and which were not to be confused with the question-box. Their business that day had occupied sufficient time without him expecting the members to listen to anything he had to say further on the subject, so that he would now only ask them to appoint a Committee to inquire into this matter, and report. He might add that, because a heap of questions were asked, many members imagined that they had to answer the lot. He should like to point out that this was not necessary at all; just those questions which interested them they could deal with. He was of opinion that, when the matter was thoroughly considered, it would be found that the idea of the question-box was a very good one indeed, and well calculated to bring them more intimately into touch with matters of the utmost importance to the industry here, as well as to associate them with their cousins over the water—a no mean advantage. He begged therefore to propose that the Committee of the Association be asked to give the question due consideration, and to report.

Mr. MEIKLEJOHN seconded the motion; and it was unanimously carried.

PRESENTATION TO MR. COOKE.

The PRESIDENT said he was sorry that, owing to the length of the proceedings, they had not more time to express to Mr. Cooke their great gratitude and appreciation of his kind and able services to the Association as Hon. Secretary during the time that Mr. Meiklejohn had been going through the Vice-Presidency and Presidency. The time of the meeting had passed so rapidly that he was sure Mr. Cooke would take "the will for the deed." They all hoped that Mr. Cooke would live long, and that he and his wife and family would long be spared to use the gift which it was his pleasure to hand him on behalf of the members. He also hoped that the wish expressed by Mr. Hunt would be fulfilled, and that before long they would see Mr. Cooke occupying the presidential chair.

The gift consisted of a beautiful tea and coffee service of very choice design, in a case befitting the handsome contents. The inscription was—

MIDLAND ASSOCIATION OF GAS MANAGERS.

PRESENTED TO A. COOKE, ESQ.,

in recognition of his services to the Association
as Honorary Secretary during the past Three Years.

FEBRUARY, 1905.

Mr. COOKE, in acknowledging the gift, said: I thank you, Sir, very much for the kind words you have spoken, and for the noble manner in which the presentation has been made. More especially I thank you for the good feeling that exists among the members of the Association towards myself. I will not, at this late hour, detain you longer. I thank you from the bottom of my heart for this presentation.

This concluded the proceedings; and the members immediately afterwards dined together.

Southern District Association.—The annual meeting of the Southern District Association will be held at the Hotel Cecil next Thursday week. The only business on the *agenda* is the consideration of the report of the Committee and the delivery of the Inaugural Address of the President (Mr. S. Carpenter, of Dorking). At the close of the meeting the members will dine together.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Thirty-fifth Annual Meeting of the Institution was held on Saturday, at the Mosley Hotel, Manchester. There was an excellent attendance of members. At the commencement of the proceedings, Mr. HARRY TOWNSEND, of Wakefield (the retiring President), occupied the chair.

The HON. SECRETARY (Mr. H. Kendrick, of Stretford) read the minutes of the last meeting, which were duly confirmed.

VOTES OF CONDOLENCE.

The PRESIDENT said he had a very sad duty to discharge. He would ask the members to pass a vote of condolence with the relatives of three of their members who had died since the last meeting. The first he referred to was Mr. J. F. Bromley, whose tragic death would be fresh in their recollection. The Institution had shown its sympathy with the late Mr. Bromley's relatives by the officials attending his funeral; a like tribute of respect having been paid in the cases of the other two deceased members, Mr. W. H. Worsley and Mr. T. L. Sheppard.

The vote was passed by the members rising in their places.

The PRESIDENT announced that the President of the North of England Association (Mr. Anderson) had within the last few days suffered a severe bereavement in the death of his wife.

It was agreed that the Secretary should send a letter of condolence to Mr. Anderson on his loss.

The SECRETARY mentioned that these matters had already been attended to, as it was thought better to do so at once rather than wait for some six weeks till the next meeting of the Institution was held. In the cases of Mrs. Bromley and Mrs. Worsley, he had received letters thanking the Institution for their expressions of sympathy. He had also written in the name of the Institution to Mrs. Sheppard.

The SECRETARY then read letters from Mr. Thomas Newbigging and Mr. J. G. Newbigging, acknowledging and thanking the Institution for the vote of condolence passed at the last meeting on the death of their relative.

LETTERS OF APOLOGY.

The SECRETARY read letters from several members regretting their inability to be present at the meeting.

ANNUAL REPORT AND ACCOUNTS.

The PRESIDENT then called upon the Secretary to read the report of the Committee. It was, however, decided to take it as read. The following is an epitome of its contents:—

The report opened with an expression of the gratification of the Committee at the continued prosperity of the Institution; all the meetings, held under the presidency of Mr. H. Townsend, having been well attended. In addition to the papers and discussions, the Commercial Sections at Manchester and Bradford were found to be the means of spreading much useful information. Visits were paid to Trafford Park, Stoke, and Bradford, where the members were hospitably entertained. At the November meeting the members accepted an invitation from Dr. Harrop, of the Milwaukee Gaslight Association, to join in the work of the Ohio Revision Board, and assist them in answering queries placed in the "Question-Box." Unfortunately the time was too short to allow of much being done; but the Committee expressed the opinion that the starting of a box among the members would materially assist the work of the Institution and enhance the value of the meetings. References were made by the Committee to the decision to affiliate with the Institution of Gas Engineers, and also to the holding of the International Gas Exhibition at Earl's Court. The latter afforded an opportunity for having an informal meeting there. A suggestion thrown out by Mr. Whatmough that the lighting and heating exhibits should be transferred to Manchester having been found to be impracticable, the opinion of the members and exhibitors was taken as to the possibility of holding an exhibition in Manchester in the autumn of the present year. The replies received led the Committee to conclude that the proposal was premature; but they recommended the holding of such an exhibition in the near future—the question to be considered again next autumn. Other subjects which engaged attention of the Committee during the year were the investigation of the naphthalene question by the Southern District Association and the engagement of a gentleman to deliver lectures at intervals. The Institution lost three members by death; and the total number on the roll at the close of the year was 143—five having been added.

The PRESIDENT then formally moved that the statement of accounts (which showed a balance of £10 7s. 3d. in hand), in conjunction with the report, be received and adopted.

Mr. HUTCHINSON called attention to the item of £13 9s. 3d. for the reports of the proceedings. Though he had formerly held a contrary opinion on the point, he had now come to the conclusion that this was an unnecessary expense, and should be discontinued. He would therefore move its omission.

The SECRETARY said the £13 9s. 3d. was entirely due to the reproduction of their transactions in pamphlet form. The amount was heavier than usual, because the one issued for the last annual meeting was a very bulky one.

Mr. R. WATSON (Doncaster) seconded Mr. Hutchinson's proposal. He was glad the matter had been brought forward, because he found that they had spent more than they received. It had been suggested by the members of the Southern Association and the Midland Association that the issuing of an abstract of the proceedings was almost a waste of paper, because they had full reports in the "JOURNAL." In his opinion, the practice of publishing their proceedings in pamphlet form might be dispensed with; and it would be better to purchase the volume of proceedings of all the District Associations. He threw this suggestion out for the consideration of the Committee.

The PRESIDENT said this matter received consideration at the hands of the members some two or three years ago, when it was put to the vote, and decided to continue the pamphlets.

Mr. ISAAC CARR (Widnes) said, as one of the members of the Institution who had not subscribed to the volume of District Association reports, he should be sorry to see the little pamphlets with which the Institution had for so many years identified themselves disappear. The matter was very fully discussed three years ago; and a majority of the members at the time resolved that it was the right and proper thing to continue the pamphlets. He should regret any departure from the course then decided upon. In regard to the question of overspending their account, he thought the Committee could retrench in some better way than that proposed. The circulation of the literature of the Institution in its present form was the last thing with regard to which they should curtail expense. He was confident the Committee could conserve their funds in some other direction.

The SECRETARY said that if the members decided to do away with the little pamphlet, they must remember that they would not get the information with regard to their proceedings (except through the public Press) for nearly twelve months after. It was decided by the Institution some time ago that they should try to cut down the large surplus they then had in hand; and he thought they had succeeded. (Laughter.) The loss this particular year was not due to any lavish expenditure on the part of the Committee; there were two items which alone would account for the whole of the deficiency. When he came into office, he had handed over to him outstanding subscriptions to collect to the amount of eleven guineas. Last year he managed to get this sum down to three guineas; so that the subscriptions became swelled to the extent of eight guineas over the nominal amount. But this year the arrears had again jumped up to seven guineas. This would partly account for the deficiency in the accounts on the present occasion. Then there was one item of expenditure amounting to £6, with which they were all familiar, but which was not likely to occur again. It was really in connection with one of their meetings held about two years ago, and was an expenditure they did not expect to have to meet.

Mr. ISAAC CARR moved, as an amendment: "That the publication of the pamphlet be continued."

Mr. S. R. OGDEN (Blackburn) seconded the amendment.

Mr. HUTCHINSON wished to traverse the declaration of the Secretary that they did not get the information for twelve months. They all took in the "JOURNAL OF GAS LIGHTING."

The SECRETARY: I said, "except through the public Press."

Mr. HUTCHINSON contended that it was a waste of money; and this was his sole reason for moving the resolution.

The PRESIDENT put the amendment to the meeting, when 22 voted in favour of it, and 21 against. He declared the amendment carried by one vote.

Mr. WATSON suggested that the Committee might take the matter into their consideration whether, by the payment of another half-crown by members, the volume of the District Associations' transactions could not be purchased.

The SECRETARY said if they had to pay at the same rate for the joint publication as they paid individually, it would cost about £35, instead of £13, which they had paid for their own reports. The figure of £13 was heavier than usual; the normal one was about £8 or £9.

The PRESIDENT said if the members would kindly assist the Executive to get the balance-sheet into a little better form, they would, he thought, have much pleasure in accepting Mr. Watson's suggestion.

Mr. SEVERS seconded the original proposition for the adoption of the accounts, which was then passed.

REPORTS OF COMMERCIAL SECTIONS.

Mr. S. MEUNIER (Stockport) then read the report of the Manchester Commercial Section of the Institution.

Mr. CHAS. WOOD (Bradford) read the report of the Yorkshire Commercial Section.

The PRESIDENT proposed that the two reports be entered on the minutes.

Mr. MEUNIER seconded. He said there was no doubt that the work done by these two sections must be of great value to the industry generally, and especially to the members of the two sections in question. There was much more useful work in front of them. They had practically only just begun to feel their feet; and as they went on, he thought they would find scope for all the knowledge they possessed. By disseminating this knowledge

among themselves, they would certainly improve their work and add to the value of the gas industry.

The proposition was then put and carried unanimously.

Mr. W. PRINCE (Stoke-upon-Trent) asked if it was proposed to publish these reports in the proceedings.

The SECRETARY said they would be included in the pamphlet.

Mr. PRINCE thought it would be advantageous to have the reports of the Commercial Sections published in the technical Press. It would in many ways promote the best interests of the industry which they represented. If there was nothing in the reports which the President or the Secretary objected to, he would propose that this course should be adopted.

Mr. R. G. SHADBOLT (Grantham) said personally he did not think the time was ripe for the publication of these reports. The Commercial Sections were only just beginning to feel their feet, and he thought a premature publication of the reports would be inadvisable. If Mr. Prince's suggestion had been seconded, he should have felt called upon to move an amendment. He would not have the reports published in the Press; they should merely be entered on the minutes.

Mr. MEUNIER said that, with the concurrence of Mr. Wood, he should prefer this course to be taken for the present. He thought it would be premature to publish the reports now. Until they had had time to consider the matter fully, he could perceive no good in their publication, and he could see possible evil arising from it.

Mr. WOOD quite agreed with Mr. Meunier.

The proposition to enter the reports of the Commercial Sections upon the minutes was then put and carried unanimously.

THE QUESTION-BOX.

The PRESIDENT said the next matter to bring before the meeting was the adoption of the Question-Box. At the last meeting of the Institution the members acceded to the request of the Ohio Revision Board to assist them with the "Question-Box." Since the last general meeting, the Committee had considered the matter very carefully, and they had come to the conclusion that it would be a wise thing to adopt the system. At their last meeting, the Committee recommended the following resolution, which he would now submit to the meeting for their adoption: "That a 'Question-Box' be initiated, and the heads of the scheme as submitted be approved: (1) All questions to be sent in writing to the Secretary or specially appointed Editor; (2) a Sub-Committee to revise questions, and the Secretary or Editor to obtain replies from selected members; (3) questions and replies to be published prior to each quarterly meeting, and discussed by the members at the meetings."

Mr. J. C. BELTON (Chester) asked whether the questions would be sent to all the members, or only to those selected.

The SECRETARY said at first only to selected members.

Mr. BELTON suggested that the selected questions should be sent to all the members. He had received the papers sent from the Ohio Association; and he was struck with two things about them. One was the great preponderance of questions dealing with water-gas manufacture; and, further, that a great many could only be characterized as childish in the extreme, being questions the veriest tyro in gas manufacture need not ask. He thought it would be a great pity to go to the expense of printing a number of questions which were perfectly useless. It would be better to send out selected questions to all the members, rather than all the questions to selected members.

The SECRETARY pointed out that one of the heads of the scheme provided that a Sub-Committee should be formed to revise the questions.

Mr. BELTON said he would move that, in the opinion of the meeting, the questions should be sent to all the members.

The PRESIDENT said the only difference between the Committee's proposal and Mr. Belton's was that the Committee proposed to send the questions to selected members, while Mr. Belton proposed to send them to all members. The latter course would add to the expense; but if it was the wish of the meeting to send the questions to all members, he had no doubt the Committee would gladly fall in with the suggestion.

Mr. W. PRINCE (Stoke-upon-Trent) seconded Mr. Belton's proposition.

The PRESIDENT said he would not put the matter to the vote, but would take upon himself the responsibility of adopting the suggestion.

A MEMBER asked how often the questions were to be sent out.

The PRESIDENT: That must, of course, be at the discretion of the Committee.

The original resolution was put and carried unanimously.

The PRESIDENT then moved: "That this Institution co-operate with the Ohio Revision Board. (1) Questions and replies to be exchanged with the Ohio Revision Board. (2) Replies to our questions to be requested from American engineers, and replies to American questions to be given by our members." He said this was going a little farther than was suggested at the last meeting, when it was agreed to co-operate with the Board in connection with these questions. It was now proposed to institute a "Question-Box" of their own, and ask the co-operation of their friends on the Ohio Board to deal with these questions.

Mr. HUTCHINSON asked if the Committee had considered the recent publication of letters from certain consulting engineers in America on this question, as to whether or not there was a covert attempt to gain information without paying for it.

Mr. T. B. BALL (Rochdale) suggested that they should confine the questions to this side of the water, as he thought they had more talent and wisdom to communicate. As Mr. Belton had pointed out, the American questions dealt largely with the subject of water gas.

Mr. HUTCHINSON seconded this suggestion.

The PRESIDENT pointed out that if this proposition were carried as an amendment, it would be undoing what was done at the last meeting.

Mr. BALL said it did not prevent their co-operating with their American friends as far as the members wished. It only precluded their asking the Americans to do the same.

The SECRETARY said that he had in his hands a letter from the Ohio Board, dated Oct. 5, which he read at the last meeting. One sentence was: "Any proposal from you outlining some plan of co-operation will be received with pleasure."

Mr. HUTCHINSON said he could quite understand that; but still they should take cognisance of some letters which had recently appeared in the "JOURNAL OF GAS LIGHTING." There seemed to be more in the matter than appeared on the surface.

Mr. MEUNIER said he thought Mr. Ball's objection was already covered by the fact that the Committee would revise the questions to be sent out. What they wanted were working, practical questions—not questions with regard to how extensions were going to be carried out.

The PRESIDENT said he should be very sorry if they in any way acted ungraciously to their American friends. At the last meeting, their invitation to discuss these questions had been accepted; and he was afraid if they carried the amendment in its present form, it would seem an unfriendly act. If there was any difference of opinion on the point, he would much rather have the matter referred back to the Committee. Perhaps it would be better at the same time to consider the whole question. The meeting had already passed a resolution dealing with the Committee's first recommendation; but under the circumstances, he thought the Committee had better reconsider the matter, He would therefore withdraw the resolutions for the present.

AFFILIATION WITH THE INSTITUTION OF GAS ENGINEERS: ELECTION OF A DISTRICT MEMBER OF THE COUNCIL.

The PRESIDENT said in connection with their affiliation with the Institution of Gas Engineers, it now became their duty to elect by ballot a District Member to represent the Institution on the Council of that body. The Committee recommended for this office the Junior Vice-President, who would shortly be their Senior Vice-President, Mr. J. H. Brearley. He thought as Mr. Brearley was so nearly elected on the last balloting list of the Institution of Gas Engineers, it would be only right to pay him the compliment of proposing him as the first representative of their Institution on the Council.

Mr. H. HAWKINS (Todmorden) seconded the resolution; and Mr. HUTCHINSON supported it.

The resolution was unanimously agreed to.

Mr. BREARLEY thanked the members very heartily for his election.

THE PROPOSED GAS EXHIBITION IN MANCHESTER.

The PRESIDENT said the Committee had taken this matter into consideration, and had come to the conclusion that it would not be prudent to attempt to hold a gas exhibition in Manchester next autumn. At the same time, it was thought that an exhibition should be held in Manchester in the near future; and accordingly a resolution had been passed to the effect that the matter should be reconsidered by the then existing Committee this time next year. He took it that this course would meet with the approval of the members, and that it was not necessary to move any resolution on the subject.

The SECRETARY did not know whether the members wanted to be informed of the result of the appeal which had been made to the exhibitors.

The PRESIDENT said it was not necessary to go into details. He would merely state that they were guided in this decision by the express wish of the exhibitors themselves. An exhibition could not be made a success without the cordial co-operation of exhibitors; and as they had been put to so much expense in the highly successful exhibition held at Earl's Court, he felt that they could not be expected to incur such a heavy outlay again until they had had time to recoup themselves.

MOTION BY MR. BELTON.

The PRESIDENT then called upon Mr. Belton to move the motion of which he had given notice.*

Mr. BELTON said he was in a rather peculiar position. When he gave notice of his motion at the last meeting, he did so without being aware that he was trespassing upon the province of the Committee. He had since found, on looking over the rules, that he was out of order in giving such notice without first submitting it to the Committee. Further than this, he understood that the Committee had taken the matter into their consideration, and that a decision had been arrived at. Therefore he did not propose to take up time with any further discussion.

The PRESIDENT asked if it was to be taken that Mr. Belton did not wish to proceed farther with the motion.

* The motion was to limit the excursion meetings of the Institution to one per annum.

Mr. BELTON said that if the members wished him to move the motion, he would do so; but otherwise he did not desire to take up the time of the meeting unnecessarily, understanding, as he did from the Secretary, that the Committee had considered the matter, and had arrived at a decision upon it.

The PRESIDENT said the Committee had certainly considered the matter, though he was not aware that they had arrived at a decision. They were rather in the position of waiting to hear from Mr. Belton.

MR. BELTON asked if he would be in order in submitting his resolution.

The PRESIDENT said as Mr. Belton himself had agreed that it would not be in accordance with the rules, the better course would be to appeal to the Committee, and let them consider it in the first instance, rather than have a premature discussion at this meeting.

INDUCTION OF THE PRESIDENT-ELECT.

The PRESIDENT said the only remaining duty for him to discharge was a very pleasing one; and that was to induct the new President into the chair. He was certain that they would all agree that the interests of the Institution were very safe in the hands of their friend Mr. Meunier, who had already rendered very great service by introducing and carrying out the Commercial Section. He was sure they would all wish most cordially that he would have health and strength to make his year of office a successful one, and to perform the functions of his new position with satisfaction to himself, when he was quite certain it would be of advantage to the Institution. He had much pleasure in asking Mr. Meunier to take the seat he was vacating.

Mr. S. MEUNIER (Stockport) then took the chair, and met with a very cordial reception.

The PRESIDENT said, before inflicting his address upon the meeting, he had a very pleasing duty to perform, and that was to propose that their heartiest thanks be given to their retiring President. Mr. Townsend was an old friend of the Institution. They had had many opportunities of judging his value; but he thought that during his year of office he had practically topped all his records. His work had been most arduous; and his attendance at Committee meetings and various other functions—in short, his conduct generally—had been most exemplary. He felt sure that he had well kept up the office of President, and had set him (Mr. Meunier) a very difficult task to follow.

Mr. WOOD seconded. As a Past-President, he knew what the duties were; and he was sure that Mr. Townsend had filled the office to the satisfaction of every member.

The resolution was then put and carried with acclamation.

Mr. TOWNSEND, in returning thanks, said he suspected that very few of them realized what they had before them when they set out on such a task as assuming the office of President of the Institution. He could truly say that he had done his best; and if his humble efforts had met with their approval, he had been amply repaid for any trouble.

The PRESIDENT then proceeded to deliver his

INAUGURAL ADDRESS.

Gentlemen,—In the first place, allow me to thank you very sincerely for the honour you have conferred upon me by electing me to the position of your President during the ensuing year. It is a position which has both its duties and its pleasures; and if I can only carry out the duties equally as well as have my predecessors, and we can all mutually enjoy the pleasures and profits of our meetings to as great an extent as heretofore, I shall hand over the reins of government to my successsor feeling that, if I have not added particular lustre to the records of the past, the strong position this Institution has always occupied has not in any way been weakened. I must also apologize for any shortcomings in this address, inasmuch as the time I have been able to devote to it has, through stress of much other work, been all too short for me to present to you anything more than a crude effort.

Our ranks, I am sorry to say, have been depleted during the past year by the passing away of some old friends. I refer more especially to Messrs. J. F. Bromley, W. H. Worsley, and T. L. Shepherd—the former in the actual performance of his duty, and, there is not the slightest doubt, in a gallant endeavour to rescue another from a dangerous position—a deed performed in that self-sacrificing and heroic spirit which always has been, and I trust always will be, an attribute of the members of our profession. The total membership is now 143—a diminution of three in our roll, as, in addition to the gentlemen named above, we have lost the services in various ways of five others, making a total of eight, against which five new members have entered our ranks.

I am not aware how many of this total of 143 are members of the Institution of Gas Engineers, but I would like to draw the attention of those who are not to the special benefit which affiliation with the parent body has, during the next twelve months, placed within their grasp—viz., that of joining the Institution without the necessity of paying an entrance fee for so doing. This privilege I would earnestly urge them to take immediate advantage of, because, among other reasons, I am strongly of opinion that the scope and work of that Institution will in the future be very greatly and usefully extended, and possibly in a direction that perhaps at the moment has hardly been more than mooted occasionally. No doubt these present vague ideas will gradually shape themselves into a concrete form, and in due course be worked out by the Institution for the benefit of the gas industry as a whole. In order to enable the Council and members of the Institution to carry out their present and possible future duties to the greatest advantage, it is absolutely necessary that their ranks and their funds should be strengthened by the addition to their roll of, if possible, all responsible representatives of gas undertakings throughout the United Kingdom. By so doing, the parent body will be placed in the position of representing the gas industry in the fullest possible sense, and thus enabled, by the influence and power of its wide representation, to bring about many desirable things which are felt to be needed for the proper advancement of the business we are engaged in.

As has often been mentioned before, one of the greatest, if not the greatest, difficulties which faces a newly-elected President is that of finding new or little travelled fields from which to gather subject-matter for his address, more especially as the ever-increasing number of Institutions—a fact, by the way, which I by no means deplore, so long as it conduces to further the knowledge and progress of the nation as a whole—accentuates the difficulty. It appears to him always as if everything he can think of has already been dealt with, and better dealt with, by others than can possibly be done by himself. Such a difficulty I also have experienced; and all the thought I could bring to bear upon the question showed me only one branch of our business upon which, perhaps, something might be said with advantage at the present time, especially when consideration is given to the conditions as to competition which are gradually growing up around us. I therefore venture to place before you some ideas upon a few of the more important commercial and other points of an undertaking's balance-sheet. They are not to be taken as more than suggestions for future thought, nor the figures given in the tables of gas-costs to be read as intended to lay down a definite formula, but merely as an endeavour to throw some little light upon the vexed questions of paying and non-paying business, and the prices which should be charged to the various classes of consumers in order that each should bear the proper quota of the necessary expenses of running that business. Taking, first, the expenditure side of an annual balance sheet, we come to

Coal.—This, which is the very *crux* of our business, and upon whose regularity of price, supply, and quality so much depends, is not, I am afraid, always bought, dealt with, or watched, with that care which it should receive. There is the feeling of conservatism on the one side which precludes a change from the orthodox classes which have been in use in some particular works for years, whatever price they may be offered at, because the qualities are known, the men accustomed to their working, and the manager is not unduly troubled with the possibility of any change either for better or for worse which may require additional care or attention on his part, and the feeling of false economy on the other, which makes it extremely difficult for the enterprising manager to induce his directors or committee to believe in the necessity of buying any but the cheapest priced material, irrespective of quality. The first is undoubtedly the wiser policy of the two, where coals of the standard qualities are purchased; but neither method is the progressive one, which outside competition renders necessary for the welfare of the gas industry.

The larger works, we know, are in a position to make tests, and generally do, both of the samples from which they buy and of the bulk bought; but it is not always possible for small undertakings (who largely preponderate in numbers) to carry out this work, either because they cannot afford the necessary capital for the plant, or because the manager has so many matters included in his duties that he cannot spare the time to carry out the tests, and the employment of a chemist or assistant for this purpose would mean too great an expense for the department to bear, as also would the sending of a sample to an analytical chemist. In such cases, why should not the larger undertakings come to the assistance of the smaller ones by carrying out the necessary work for them at a nominal fee to cover net cost. Each large works would then be the centre of a sub-section comprising a number of smaller ones. The work entailed would not be great, as no doubt many of the coals, particulars of which were asked for, would have already been tested by them for their own purposes; but even if not, the work would give them the benefit of additional knowledge as to how the quality of material supplied in bulk is kept up at other works than their own, and would give a greater number of comparative tests to calculate the value of a coal upon. In addition, they would have an indication as to which coals used in their immediate neighbourhood were most regular in quality; and there would be, further, a saving to themselves by the fact that they would have additional analyses of materials for their own purposes, samples of which cost them nothing.

Another and most important point, and one which all of us have had to realize during the past four or five years, is the inconvenience and loss entailed by variations in the prices of this commodity. The last sudden rise (in our case equal to 70 or 80 per cent.) necessitated everywhere alterations in the price of gas, with the consequent result, which nearly always prevails when this has an upward move, of a stoppage in the increase, if not an actual decrease, in the consumption; and though it may be said that undertakings have had opportunities since of recouping themselves during the gradual dropping of quotations by keeping the

prices of their own commodity up, yet the actual money itself hardly covers the stoppage of progress in the department and the upsetting of consumers from the even tenour of their ways. In addition, variations in the price of gas, except in the direction of reductions, always tend to a feeling of unrest among consumers, which no amount of explanation entirely allays, more especially in a corporation undertaking. With this, there is always a feeling that the increase is higher than it need be, in order to reduce rates or to furnish an amount for additional expenditure in other departments at their expense.

If it were possible to avoid these fluctuations by consultation with colliery proprietors, with a view to forming some sort of sliding-scale where the ruling item should be such a price at the pit as would leave a fair margin of profit—this to be subject to alteration only by increase or decrease in wages and railway rates and waggon hire, the sliding-scale to be revised periodically (say, every five or seven years)—then much of this would be saved, prices could be kept much more regular, and the energies of the manager not so often damped by having his efforts for reduction of cost and price of gas totally upset at the critical moment. There are many difficulties no doubt which only the colliery proprietors themselves can realize. But difficulties exist to be overcome; and I certainly think that, given the desire on both sides, they can be surmounted, more especially as the quantity of coal to be dealt with on such lines is not very great, because, according to the report of the Royal Commission, only about 15 million tons a year, out of a total of 167 million tons, are required solely for gas-works purposes, or about 11 per cent.

Purification.—The variations in cost of this are not very great, and should not be allowed to come in as against the purity of the finished article; yet, given this, it would appear as if more interest should be taken in the working up of oxide with a view of realizing the highest possible price for the spent material. The question of the prussian blue contained therein is not very often taken much into consideration; and the benefit of this is often reaped by the manufacturers instead of by the gas undertaking. The proportion of prussian blue contained in the oxide varies considerably in various works, even from similar varieties of coal; and investigation would no doubt lead to a better understanding as to the causes of such variations, and to the means of working by which the heaviest possible percentage of it could be extracted from the gas with the least possible special plant, and in its most marketable form. The spent lime might, I think, be made more use of. I know that in some works a small price is obtained for it for farming purposes; but in the majority of cases it has to be given away—at times, and on some works, the removal has actually to be paid for. Mixed and ground with the works clinker we have found it makes splendid mortar, and, indeed, we rarely use anything else for our work, even supplying it to contractors for extensions. It is quite feasible that a sale for it might be worked up with advantage to the department in many towns.

Salaries.—This is not an item upon which many of us wish to see a direct saving; but if directors and members of committees could realize that the better they paid their chief officials the more interest and effort would be devoted to their service, the better it would be for all concerned. How much more could be done if managers were assured that their efforts were not only properly remunerated, but were received with hearty appreciation by their superiors? If the latter are afraid to overstep a certain limit, by all means let them enter into an arrangement to pay a certain definite sum per annum together with a percentage in addition dependent upon results. I venture to say that the majority of us would be perfectly prepared to enter into an agreement on these lines.

Wages.—While these, contrary to the rule as to salaries, have a continual tendency to increase, yet I would be the last to object. Badly paid labour is never good labour; and rather than try to reduce rates of wages, it would be better to increase them still more, if by this means better, more efficient, and less careless work should be the result. The waste of materials, damage to tools, neglect of the many things one is continually coming across in a walk round a large works, would, if done away with by the engagement of men with more feeling of responsibility to their employers, far more than compensate for even further increases. In connection with this item, comes the point as to whether profit-sharing could not with advantage be everywhere introduced. With companies it has been shown to act well; and it also should with corporation undertakings. The difficulty in the latter case, however, is to settle the basis, because the profits to be made are not fixed definitely, as is done in the case of companies, by the dividend to be paid. This might be got over by taking, instead of the selling price of gas, the actual cost of making and distributing it. I have not had time to work out any figures to see whether this is feasible or not, and simply throw it out as a suggestion for further consideration.

Maintenance.—This is an item generally pretty closely watched, but sometimes, especially for the purpose of showing a better result on some special year, somewhat neglected. All that can be said is that the more regularly and systematically repairs can be carried through without allowing the plant to go too long without attention, the better will be the financial result; the proverb of "a stitch in time" is a good one to remember. Another point always useful to bear in mind is that it is often cheaper to scrap plant or material and buy new than to repair, more especially where the repair work has to be put out. A little calculation will always show this. The question of repairs to mains, services, and meters is a most important one, on account of the loss in revenue through leakage or incorrect registration. If records were carefully kept so as to know how long these various portions of the plant had been in use, and arrangements made for periodical examination, more especially of services and meters, much money might be saved. One per cent. of leakage means a large amount of money lost per annum; and if this were capitalized, the sum which could be economically spent each year for this purpose would be easily ascertained.

Rates and Taxes.—This is a question constantly recurring and always irritating, not from the fact of such having to be paid, but that, owing to the method of applying the various Acts relating thereto being read in such a variety of ways by the various rating authorities, the anomalies throughout the country are such as one ought not to find or expect. The accompanying table of 32 towns will give some idea of the enormous variations existing. It would appear as if the present system, which is complicated and expensive, and which necessitates constant appeals to a higher tribunal, unless undertakings are willing to allow themselves to be victimized, ought to be either done away with or materially altered. It is certain that the hypothetical tenant, in making his arrangements as to rent, would first of all take into consideration the matter of profit realizable, and that over a period of years, together with the probabilities of further extended business and the amount of rates then being paid. That being so, would it not be feasible, as a general rule, to find a percentage figure based on the gross profit, which would apply to the majority of gas undertakings? In the case, of course, of a corporation concern which by its Act is precluded from making profits, then a percentage figure based on the capital outlay or income derived might be taken, or, if either one or other of these items were not thought to be sufficiently fair, some arrangement might be come to by which any two, or even all three, could be taken into consideration, and such a rateable value fixed as would fall between certain definite percentages of each. The principle, once arrived at, would be easily worked out by both the assessment committee and the undertakings interested. I am aware of the difficulties which exist in formulating any system which would be absolutely fair all round; but if we can replace the present irritating and cumbersome one by any other which will materially minimize the troubles and inconveniences so generally found, then I cannot help but think that a step in the right direction has been taken.

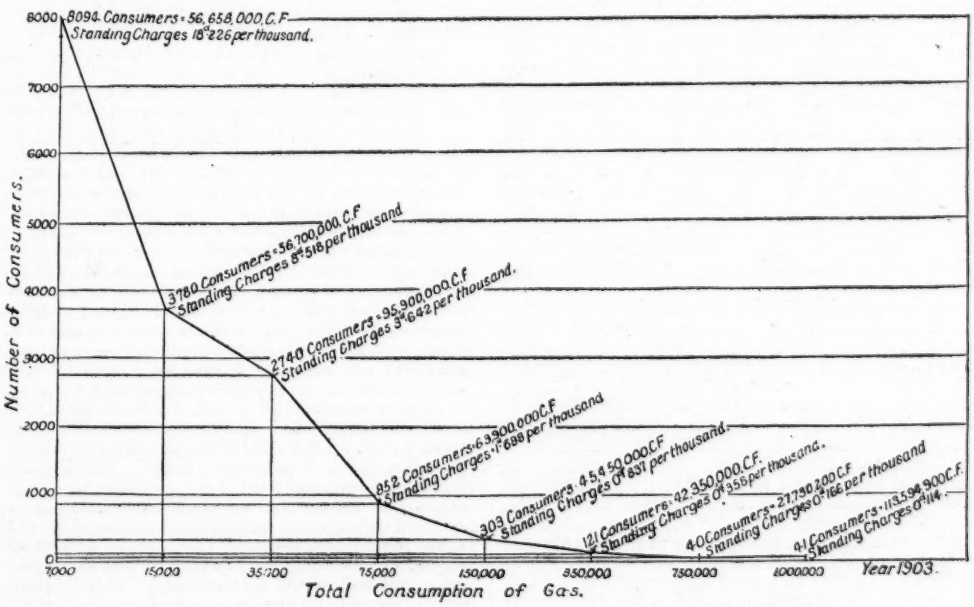
The subject of income-tax also, as applied to corporations, needs some looking into, not only for consideration of the items included by some and left out by other surveyors, but also from its effect upon the gas consumer. As you are perfectly aware, the profits of a corporation undertaking are generally taken in relief of rates, and upon these profits tax is charged. Now the consumer, by reason of this, is not only charged in his price for assistance to the ratepayers who are not consumers, but also for income-tax payable by what is generally the only paying department of a corporation. It may be said that he gets something back himself by the diminished municipal rates. But how much can be estimated when it is considered that in many industries 1d. per 1000 cubic feet will represent to a manufacturer anything from that amount in the pound to as much as 2s. 6d. in the pound—that is to say, that the actual total paid by him for gas during a year for that 1d. increase is equal to the sum he would have to pay if the rates (in the latter case) had been put up 2s. 6d. in the pound. From the income-tax, therefore, he derives no benefit at all, nor do the corporation either. It would appear that in such cases income-tax should only be charged against the latter on the whole of their various undertakings, which would have the effect of increasing the revenue and profits of the Gas Department by the amount paid; so ultimately bringing about what we are all so anxious to see—viz., a lower price of gas. These questions have already been debated by your Commercial Section, and, as you hear from the report, will be brought forward again. They are most important, and will repay full ventilation.

The other items on this side I do not propose to touch, but will venture some opinions on the receipts side.

Coke.—This article as well as other residuals has not, I am afraid, always been dealt with on the strict business lines that should obtain in every undertaking. Many times it has been said: "Oh! get without it at the best price you can get"—a phrase which, although it sounds, and is to a certain extent, quite correct, has generally been read with the addition, in practice, if not in words, "with as little trouble as possible;" and there is no doubt that this is a policy which has largely prevailed. It is not always realized what an important bearing the sale of this residual under the best conditions, not only available, but which can be made available, either by searching for special markets or manufacturing a special article for that market, has upon the results at the end of the year, by the enhanced value obtained. It therefore behoves us all to fully consider how far the old lines of business still hold good, and how, and to what extent, they should be brought up to date. I have often noted advertisements in our Technical Journals asking for quotations for all the surplus coke to be made during the twelve months at a works—no special quantity is named, no particulars as to weight to be removed month by month are given—simply surplus, whatever it may be. I know that some approximate idea on these points may be formed; but the whole matter must of necessity be very

Return of Rateable Value, &c., of Various Gas Undertakings—September, 1903.

No.	Gas Sold.	Total Rateable Value.	Total Capital Expended.	Percentage of Rateable Value to Capital.	Income from Gas, Coke, Tar, and Liquor.	Percentage of Rateable Value to Income.	Gross Profits.	Percentage of Rateable Value to Gross Profits.	Rateable Value per 1000 Cub. Ft. of Gas Sold.	Rates Paid per 1000 Cub. Ft. of Gas Sold.	Price of Gas.	Percentage of Rates Paid to Price per 1000 Cub. Ft.
	Cub. Ft.	£	£		£		£		d.	d.	s. d.	
1	117,565,000	4,282	85,549	5·00	20,818	20·56	6,283	68·15	8·24	2·23	2 10	6·56
2	337,839,000	9,458	367,752	2·57	56,533	16·73	17,800	53·13	6·72	2·08	2 9½	6·20
3	960,862,000	15,500	668,136	2·31	164,197	9·43	62,260	24·89	3·84	1·10	2 6	3·66
4	165,918,000	4,681	182,919	2·55	25,307	18·49	10,897	42·95	6·72	2·76	2 3	10·22
5	162,796,000	3,251	130,405	2·49	27,824	11 68	8,050	40·38	4·80	1·62	2 9	4·90
6	365,311,850	12,748	279,574	4·55	55,673	22·89	16,371	77·86	8·40	2·54	1 11	11·04
7	111,623,000	3,168	72,274	4·38	..	..	9,654	32·81	6·72	1·15	3 3	2·94
8	45,962,800	714	57,054	1·25	8,279	8·62	3,677	19·41	3·60	1·02	3 0	2·83
9	136,482,000	4,243	112,840	3·76	24,162	17·56	6,715	63·18	7·44	2·48	2 7½	7·87
10	197,120,000	5,465	208,361	2·61	34,310	15·92	13,325	41·01	6·72	2·49	2 8	7·78
11	173,358,000	3,260	..	..	30,764	10·59	6,612	49·30	4·56	0·75	2 6	2·50
12	77,764,000	1,040	50,561	2·05	14,080	7·38	3,112	33·41	3·12	1·04	2 9	3·15
13	54,507,818	2,605	47,437	5·49	11,419	22·81	3,990	65·28	11·28	3·71	3 4	9·27
14	121,721,400	2,873	79,912	3·59	20,653	13·91	5,022	57·20	5·52	1·72	2 11	4·91
15	71,474,000	705	84,803	0·83	13,682	5·15	..	..	2·40	0·88	3 1	2·37
16	133,319,000	3,337	93,996	3·55	24,401	13·67	7,147	46·69	6·00	1·75	2 8	5·46
17	173,122,300	4,830	138,688	3·48	31,150	15·50	10,716	45·16	6·72	1·32	2 3	4·88
18	141,735,000	4,492	159,695	2·81	25,946	17·33	9,013	49·83	7·68	2·07	2 10	6·08
19	51,500,000	1,577	36,284	4·34	9,800	16 09	2,800	56·32	7·44	2·44	3 1	6·59
20	79,650,300	1,600	75,836	2·10	14,262	11·21	3,125	51·20	4·80	1·88	2 7½	5·96
21	108,436,000	2,024	129,169	1·56	19,113	10·58	4,904	41·27	4·56	1·47	3 0	4·08
22	93,390,500	1,590	94,881	1·67	17,138	9·27	3,857	41·22	4·08	0·93	3 1	2·51
23	54,582,000	1,840	45,878	4·01	10,872	16·92	655	280·91	7·92	2·56	3 4	6·40
24	133,085,000	5,875	156,686	3·74	27,215	21·58	11,891	49·40	10·56	3·00	3 3	7·69
25	68,353,000	2,770	57,335	4·83	14,195	19·51	4,718	58·71	9 84	2·96	3 5	7·21
26	496,320,000	12,499	259,343	4·81	88,544	14·11	35,450	35·25	6·00	..	2 8	..
27	240,122,800	4,494	203,357	2·20	45,119	9·95	13,197	34·06	4·32	2·14	2 9	6·48
28	218,250,000	7,551	156,522	4·82	44,392	17·09	11,886	63·52	8·40	2·92	3 4	7·30
29	159,841,000	2,169	128,425	1·68	24,909	8·70	7,995	27·12	3·12	0·93	2 3	3·44
30	129,152,600	2,194	84,782	2·58	21,716	10·10	8,252	26·58	4·08	1·55	3 1	4·18
31	121,728,000	865	160,850	0·53	22,649	3·81	8,886	9·73	1·68	0·49	3 1	1·32
32	348,698,000	7,807	249,243	3·13	62,320	12·52	16,522	47·25	5·28	1·79	3 6	4·26
Total .	..	141,507	..	95·27	..	429·66	..	1633·18	192·56	57·77	..	170·04
Average	..	4,422$\frac{3}{32}$	..	3·07	..	13·86	..	52·68	6·01	1·86	..	5·48



Analysis of the Stockport Corporation Gas Accounts (Standing Charges) for the Year ending March 31, 1903.

	£ s. d.		Consumers.		Per Consumer per Annum. s. d.	0 to 1000 7,000 d.	10 to 20 15,000 d.	20 to 50 35,000 d.	50 to 100 75,000 d.	100 to 200 150,000 d.	200 to 500 350,000 d.	500 to 1000 750,000 d.	1,000,000 d.
Salaries	1,754 7 2	÷	24,619	=	1 5·12	2·445	1·141	0·489	0 228	0·114	0·048	0·022	0·017
Repair and maintenance of pipes .	1,142 18 3	÷	,,	=	0 11·14	1·591	0·742	0·318	0·148	0·074	0·031	0·014	0 001
Repair and renewal of meters, &c. .	3,540 14 7	÷	,,	=	2 10·53	4·933	2·320	0·986	0·460	0·222	0·097	0·046	0 034
Rents	158 1 0	÷	,,	=	0 1·54	0·220	0·103	0·044	0·020	0·010	0 004	0·002	0·001
Rates and taxes	4,166 17 3	÷	,,	=	3 4·50	5·786	2·699	1·157	0·540	0·267	0·115	0·054	0·040
Salaries and collection	1,579 7 6	÷	,,	=	1 3·39	2·198	1·026	0·440	0·205	0·102	0·044	0·020	0 015
Stationery and printing	450 1 0	÷	,,	=	0 4·38	0·626	0·292	0·125	0·058	0·029	0 012	0·006	0·004
General establishment charges . .	219 14 11	÷	,,	=	0 1·98	0·283	0·132	0·056	0·026	0·013	0 005	0·002	0·002
Miscellaneous charges	43 4 10	÷	,,	=	0 0 42	0·060	0·028	0·012	0·006	0 003	0·001	0·000	0·000
Bad debts	54 0 7	÷	,,	=	0 0·52	0·074	0·035	0·015	0·007	0·003	0·001	0·000	0·000
Totals	13,109 7 1				10 7·52	18·216	8·518	3·642	1·698	0·837	0·358	0·166	0·114

indefinite. What is the effect? The only people who can afford to run the risk of the market under such conditions must be men of capital and in a fairly large way of business. Those who tender may also have some other reason for quoting, such as the possibility of obtaining a contract for coal, which will assist them in avoiding possible loss, and in any case helps them in the matter of waggons. This narrows the field to a few competitors in any given district; hence the price offered is usually very much on the low side, the business at best being of a very speculative character. The contract having been made, what are its advantages and disadvantages?

Advantages.	Disadvantages.
Narrows the limits of variation in yard price.	When shipping or foreign trade keeps up or increases, may have difficulty in keeping sufficient stock for his ordinary local trade.
When local sales and prices keep up or advance, does not suffer diminished revenue.	When outside prices reduce and markets fall, difficulty in getting stock kept down, by reason of the trouble contractor has in placing the material.
No anxiety as to disposal. Can call on contractor at any time to clear or at any rate to keep stock down.	Possibility of others having sold on same conditions at prices which admit of dealers sending into the town at prices lower than the existing yard price, so reducing it or increasing stock for sale at the contract price.
If market goes down below price sold at to contractor, no loss to the department.	Generally a lesser average price obtained over year.

This system has been found to materially affect other neighbouring concerns, as naturally a dealer called upon to clear under contract will sell in the easiest market, taking into full consideration carriage and everything else. This throws up the stocks in these towns, or reduces their prices, and so a regular and reactionary battle goes on, much to the detriment of the undertakings concerned. To a somewhat smaller, but equally certain, extent are average yearly prices affected by the action of some undertakings in lowering prices indiscrimately, and without any regard to general stocks and prices around them, or even market values—simply, perhaps, to reduce stocks on the one hand, or to avoid them on the other. A little study, or any rate a few inquiries, would no doubt enable them to find an open market for the surplus not required locally, which would achieve their object without interfering with the general good. It is within the writer's knowledge that coke has been sold in a district f.o.r. for a market where there was any amount of demand, at prices 50 per cent. higher than another undertaking were selling at in yard to any one. There are places where the demand is far greater than the local supply. These are fair and legitimate markets, and markets where prices should not need in an ordinary way to be materially cut; but, unfortunately, the methods of dealing just mentioned bring about the very state of things we should wish to avoid, and, by unnecessary competition, so upset matters as to create a great deal of cross carriage and handling without an equivalent gain either to sellers, dealers, or buyers. Coke is one of the most importance sources of revenue to a department, and as such should be carefully dealt with, and in such a way as will produce the highest possible return.

Tar.—This, again, is a residual which has not always increased the revenue as it should, although sometimes, as we have seen during the past year or two, highly inflated prices are received for it—prices which are much above market values, and can only have been offered with the view either of a speculation on the chances of such value going up, or of stopping some other contractor from having it. Time was when much was whispered about tar rings; and certainly the tenders sent in on occasion were sufficiently peculiar to warrant such ideas. But it would appear as if at last there had been a split in the cabinet, with the result of these higher quotations. However, whichever may be the system in existence at the present time, it cannot be good for an undertaking to be receiving 35s. per ton one year and only 18s. for the next. It would suit it much better to have the average of the two prices for each of the two years; there would be far less danger of loss, because, as we know, if a high price for the year has been accepted and values of bye-products fall materially, the loss necessarily incurred by the contractor cannot be borne for any lengthy period unless he be a very wealthy man. That being so, there is always the chance of bankruptcy, with the consequent sale of the quantities not taken, at a much reduced price; and also, unless very well protected by sureties or deposit, probably a further loss on that already sent in by the difference between the contract price and the dividend paid by the estate.

Would it not be preferable to diminish this spirit of gambling and increase the security of the contract by selling, as is so generally done for ammoniacal liquor, upon a sliding-scale? I know in the latter case this is much more easy to arrange than is the former; but what additional difficulties there are should be easily overcome if both sides are in earnest. The main features to be considered are the elimination of all, if possible, of the probable points of debate, leaving only the one of value of bye-products to be determined. In the agreement under which we have been selling for over ten years, the class of bye-products to be included, the quantity of each per ton of tar, the port at which values are to be taken, the sum of money to be put down as working expenses, carriage, profit, &c., are all agreed upon before the contract is made; and these items have to hold good over the whole period during which the contract runs (as a rule we have made ours for three years). The value of bye-products is settled monthly by an arbitrator on either side, and the net value of the tar notified to each.

Comparisons which we have made with other undertakings have shown that the average price obtained by us over a period of years, after taking into full consideration any differences in cost of carriage of the crude tar, on local conditions of loading, &c., has been at least 2s. per ton more than it would have been under the usual annual contract system at fixed price; and we have at the same time minimized the possibility of loss to the contractor, and therefore to ourselves, from any sudden upheaval of the markets. An arrangement for selling under a sliding contract is more difficult and troublesome to settle in the first instance; but once formed and arranged to run over a period of years, it is easily worked and generally gives satisfaction to both sides.

Ammoniacal Liquor.—One cannot say very much about this, as it is generally either made into sulphate by the undertakings themselves or sold under a sliding-scale by the ounce strength. Where sold on the sliding-scale, the boundaries of strength within which the prices are arranged to vary are not often sufficiently close, more especially where the Twaddle hydrometer is used—so often giving the contractor an undue advantage. It has often struck me, however, as to whether additional revenue could not be derived from this residual by having plant in the sulphate house, laid down and arranged in such a way as to manufacture compounds of ammonia other than sulphate, when market prices showed an advantage, or even perhaps to concentrate alone at times, or to make liquid ammonia. I have not yet had an opportunity of looking into the figures of cost for these processes; but some of you who have a better opportunity than myself will perhaps, if possible, take the question up, giving us the results, either shortly at one of the meetings of the Commercial Section, or at longer length in the shape of a paper at one of our quarterly meetings.

Gas.—The question of what should be charged for gas, or rather what discounts, if any, should be allowed to various classes of consumers, is one that is very much in evidence at the present moment. It is one also which I have had under consideration for the last three years; and in the accompanying tables I have endeavoured to show the effect which consumption, and more especially the period of time over which the consumption is spread, has upon the standing and interest and sinking fund charges of a department. The items for the standing charges are not intended to be taken as the actual and correct ones to be always included, nor the figures of cost per 1000 cubic feet as applying absolutely in every case and to every consumer in any particular class, but only as a means of showing who our profitable and unprofitable consumers are, and to what extent each assists in our profits.

The standing charges are not difficult to get at, nor the effect per 1000 cubic feet; but the interest and sinking fund charges vary to such an extent with each consumer's requirements and time of using, that to get at the actual cost for these items would, in a large undertaking, mean an immense multiplicity of figures in order to arrive at the actual price which each consumer should be charged. Broadly, the method I have adopted is this: Taking our heaviest twenty-four hours' make, and allowing sufficient spare plant to enable us to work all the year round without stopping—*i.e.*, sufficient plant in hand to replace any of the remainder which is under repair from time to time—in our case 3½ million cubic feet per day, I find that we should be able during the course of the year to manufacture, roundly, twice as much gas as we do at present. This would, if sold, at once reduce our payments on interest and sinking fund account by half. (I may mention that, for the sake of simplifying the calculations, I have taken the year as 8000 working hours.) Further, I have assumed that, if each customer had his own plant on his own works, worked with similar storage and in a similar manner to ourselves, then he would only require half the carbonizing plant of his maximum yearly requirements—*i.e.*, if this was 10 million cubic feet per annum, a carbonizing plant equal to 5 millions, *plus* the storage, and spares only would be necessary. This he could keep working continuously during the twenty-four hours, stocking throughout the whole time, but only gaining when he was not burning. This means that at the end of his day, when his mill or shop was shut down, his stock would be practically exhausted, and then he would begin to gain again ready for next day's requirements.

The maximum amount of plant required for each customer has been worked out by taking the actual burning hours throughout the heaviest quarter of the year, and dividing these into his actual consumption in order to get at his maximum hourly requirements. This maximum hourly requirement was then multiplied by the 8000 hours, which thus gave the necessary annual capacity of the plant to be installed for supplying this consumer at his time of heaviest load. The actual number of hours for the year in the Industrial Section have been obtained, as far as possible, from the manufacturers themselves; and the lighting hours have been calculated from the sunset and sunrise tables, taking the ordinary lighting and putting-out hours for the different classes of consumers into consideration—*i.e.*, say, private houses as finishing at 11 p.m., hotels, &c., at 11.30 to 12, shops at 8 o'clock ordinary days, 9 o'clock Fridays, 10 o'clock Saturdays,

TABLES SHOWING INTEREST AND SINKING FUND CHARGES.—1905.

Lighting Load.

Actual Consumption during Heaviest Quarter of Year (March).	Actual Consumption per Working Hour.	Estimated Consumption per Annum, taken at 8000 Hours.	Capital then Required, at 3s. 7d. per 1000 Cub. Ft. of Gas Sold.	Interest and Sinking Fund taken at 7 per Cent. on Capital.	Actual Consumption per Annum.	Cost per 1000 Cub. Ft for Interest and Sinking Fund.	A If Capital is taken upon Half-Consumption, as actually occurs upon Works.	Actual Hours Worked in March Quarter.	Actual Hours Worked in Year.	Standing Charges.	Interest and Sinking Fund as Col. A.	Total Costs.	—
	Cub. Ft.	Cub. Ft.	£ s. d.	£ s. d.	Cub. Ft.	d.	d.			d.	d.	d.	
445,400	880	7,040,000	1261 6 8	88 5 10	783 900	27·03	13·565	506	1092	0·166	13 565	13·731	Doublers.
577,100	1140	9,120,000	1634 0 0	114 7 7	971,600	28·25	14·125	506	1092	0·166	14·125	14·291	
623,900	1302	10,416,000	1866 4 0	130 12 8	1,104,300	28·39	14·195	479	1092	0·114	14·195	14·309	
544,400	943	7,544,000	1351 12 8	94 12 3	1,010,600	22·47	11·235	577	1534	0·114	11·235	11·349	
100,300	149	1,192,000	213 11 4	14 18 11	248,400	14·44	7·220	672	1774	0·358	7·220	7·578	
1,156,000	5809	46,472,000	8326 4 8	582 16 8	2,500,000	55·95	27·975	199	375	0·051	27·975	28·026	Cotton Spinners.
393,900	1979	15,832,000	2836 11 4	198 11 2	810,000	58·83	29·415	199	375	0·166	29·415	29·581	
290,600	1460	11,680,000	2092 13 4	146 9 8	574,000	61·25	30·625	199	375	0·166	30·625	30 791	
94,400	474	3,792,000	679 8 0	47 11 1	184,600	61·82	30·960	199	375	0·837	30·960	31·797	Hatters.
452,000	1453	11,624,000	2072 12 8	145 1 8	1,030,600	33·78	16·890	311	634	0·114	16·890	17 004	
1,541,300	4988	39,904,000	7149 9 4	500 9 3	3,225,600	37·23	18·615	311	634	0·039	18·615	18·654	
80,600	405	3,240,000	580 10 0	40 12 8	146,600	66·52	33·260	199	375	0·837	33·260	34·097	Printers.
18,000	67	536,000	96 0 4	6 14 5	41,400	38·96	19·480	269	488	3·642	19·480	23·122	Waste Dealers.
20,000	154	1,232,000	220 14 8	15 19 1	52,700	72·65	36·325	130	375	1·698	36·325	38·023	Leather Works.
								Lighting Hours.	Lighting Hours.				
77,200	103	824,000	147 12 8	10 6 8	236,900	10·46	5·230	750	2154	0·358	5·230	5·588	Hotels.
94,600	126	1,008,000	180 12 0	12 12 10	287,400	10·55	5 275	750	2154	0·358	5·275	5 633	
152,400	203	1,624,000	290 19 0	20 7 3	466,400	10·48	5·240	750	2154	0·358	5·24	5·598	
89,000	335	2,680,000	480 3 4	33 12 2	203,400	39·66	19·830	266	700	0·358	19·830	20·188	Shops.
66,400	250	2,000,000	358 6 8	25 1 8	161,500	37·27	18·635	266	700	0·837	18·635	19 472	
40,500	152	1,216,000	217 17 4	15 5 0	90,000	40·66	20·330	266	700	0·698	20·33	21·028	
23,000	86	688,000	123 5 4	8 12 6	54,600	37·91	18·950	266	700	0·698	18·950	19·648	
80,500	115	920,000	164 16 8	11 10 9	207,600	13·33	6 66	700	2034	0·358	6·66	7·018	£80 House.
174,800	250	2,000,000	358 6 8	25 1 8	369,100	16·31	8·155	700	2034	0·358	8·155	8·513	
35,800	51	408,000	73 2 0	5 0 4	94,000	12·80	6·40	700	2034	1·698	6·40	8·098	
43,000	61	488,000	87 8 8	6 2 4	129,600	11·32	5·66	700	2034	0·358	5·66	6·018	£40 House.
22,800	32	256,000	45 17 4	3 4 2	59,400	12·96	6·48	700	2034	0·837	6·48	7·317	
28,700	41	328,000	58 15 4	4 2 3	82,600	11·93	5·965	700	2034	0·837	5·965	6·802	
10,700	18	144,000	25 16 0	1 6 1	35,400	12·23	6·115	600	1657	1·698	6·115	7·813	£25 House.
7,000	12	96,000	17 4 0	1 4 0	19,000	15·15	7·575	600	1657	3·642	7·575	11·217	
11,400	19	152,000	27 4 8	1 18 1	36,500	12·52	6·26	600	1657	1·698	6·26	7·958	
2,900	5	40,000	7 3 4	0 10 0	9,200	13·04	6·52	600	1657	18·226	6·52	24·746	£15 House.
6,100	10	80,000	14 6 8	1 0 0	23,800	10·08	5·04	600	1657	3·642	5·04	8·682	
6,800	11	88,000	15 15 4	1 2 0	25,400	10·39	5·195	600	1657	3 642	5·195	8 837	
3,400	5·6	45,000	8 1 3	0 11 3	9,700	13·91	6·955	600	1657	18·226	6·955	25·181	5s. per Week House.
2,700	4·5	36,000	6 9 0	0 9 0	6,100	17 70	8·85	600	1657	18·226	8·850	27·076	
3,300	5·5	44,000	7 17 8	0 11 0	9,000	14·66	7·33	600	1657	18·226	7·330	25·556	

Industrial Load.

491,000	425	3,400,000	609 3 4	42 12 10	1,936,400	5·28	2·64	1154	4114	0·065	2·640	2·705	Doublers.
286,300	261	2,088,000	374 2 0	26 3 8	1,004,700	6·25	3·125	1093	3771	0·144	3·125	3·269	
485,900	448	3,584,000	642 2 8	44 18 11	1,622,000	6·60	3·30	1084	3728	0·078	3·300	3 378	
797,200	552	4,416,000	791 4 0	55 7 8	2,652,200	5·01	2·505	1444	4780	0·048	2·505	2·553	
157,900	219	1,752,000	313 18 0	21 19 5	518,700	10·16	5·08	720	2700	0·166	5·080	5·246	Hatters.
385,700	439	3,512,000	629 4 8	44 0 11	1,029,300	10·27	5·135	881	3292	0·133	5·135	5·268	
432,400	569	4,552,000	815 11 4	57 1 9	1,458,400	9·39	4·695	760	3042	0·086	4·695	4·781	
29,100	44	352,000	63 1 4	4 8 3	102,100	10·37	5·185	650	2500	0·837	5·185	6·022	Leather Works.
61,500	90	720,000	129 0 0	9 0 7	215,500	10·05	5·025	680	2655	0·358	5·025	5·383	Printers.

ordinary mills at 5.30, and the hat and other manufacturers at 5.30, adding on to the latter any overtime that they may have worked. I may say that no allowance has been made for gas cooking stoves or fires in working out the costs of an ordinary household consumer. The effect of the number of hours over which consumption is spread is shown very clearly by a study of these tables, varying as they do from 2·505d. to 36·325d. per 1000 cubic feet in the interest and sinking fund column alone; while the effect of quantity can be seen in the standing charges column. The two combined give the total costs applicable to each class of consumer outside of the cost of manufacture, &c.

It was after consideration of the cost of standing charges that my Committee decided over twelve months ago to allow for industrial purposes only discounts up to 10d. per 1000 cubic feet. This is worked out as follows: The consumer's apparatus, whether gas-engine, gassing frame, hatters' stoves, or confectioners' ditto, is tested for its maximum hourly consumption. This is multiplied by 50 hours for one week's work and by 13 weeks for the quarter; the total amount of gas shown is the quantity required to be consumed during that period to earn 10d. per 1000 cubic feet discount. If the actual quantity does not come to this, then a *pro rata* discount is allowed, varying by pennies—*i.e.*, supposing the number of cubic feet only shows the equivalent of 40 hours maximum requirement per week, then 8d. per 1000 cubic feet is allowed; while if it shows only 5 hours maximum requirement per week, 1d. per 1000 cubic feet is allowed. I may say that some of our consumers actually obtain the 10d.; while the average runs out at about 6d. The total cost to us of this special allowance last year was about £1800.

There are many considerations, of course, which have to be taken into account in allowing large discounts based on the figures I have found. One is that the smaller consumer would

have to pay such an additional price as would most probably at once induce him to have his gas cut off and to go back to oil, and the largest consumer also using only one hour per day would be under similar conditions, but would take to electricity generated directly from his own engine for his cure. Such radical changes would completely upset the profits of an undertaking; so that anyone who wishes to make allowances must necessarily move slowly. Yet, at the same time, the competition which our industry now has to face makes it an absolute necessity for us to move in the direction of special encouragement to those users who do the most to earn our revenue and make our profit; and that as rapidly as possible. It was with these points in mind that these tables were prepared; and it is with the same object that I have placed my ideas upon the commercial side of our work before you, believing it to be an absolute necessity for us in the first place to increase our revenue from our various residuals as much as possible, and, in the second, to reduce our cost of manufacture to the greatest extent, so that, in the third place, we may be in a position to sell our primary commodity to the best class of our consumers at such a price as will not only increase our sales with them, but at the same time enable us to keep the foremost place in the race of competition now going on for industrial gas, while not forgetting to treat as well as may be our original clients—consumers for lighting purposes.

To the Commercial Sections, in the first place, I would suggest the consideration of these and many other points, which should, and can, be relegated to them with advantage, as, although originally started for mutual discussion, advice, and information on the every-day questions constantly before us, yet, as the report presented to you to-day shows, it has been found possible to enlarge this original idea very materially; and as the scheme is still, so far, in its infancy, I feel convinced that, as it grows older, its advantages become better understood, and its work more systematized, it will be the breeding ground of many ideas for the better carrying on of our profession. These, after being thoroughly thrashed out and formulated, can be passed on to this Institution, and from you, if thought desirable and necessary, to the parent Institution, and through them, as the representatives of the whole gas industry of the United Kingdom, to the authorities who have to deal with the matters raised, even to the Legislature itself if necessary, with a view to getting them carried out, whether they be amendments in existing Acts, the interpretation of these, such as, for example, we find in the assessment of gas-works, &c., instructions for testing, or any other questions which will either help in the removal of obstacles to the general progress of the industry or in the supply of a pure article at a cheap rate suitable for every purpose for which it is required, without the undue restaint or restrictions now so often met with.

It is in this direction that one of the principal possibilities of Commercial Sections lies, because it is at their monthly meetings that all the rough work of comparisons of experience, debating the various points, and finally formulating suggestions for draft schemes to be laid before their District Institutions for further wider discussion and such alterations as may be thought desirable by them in order that the matter when presented to the parent Institution may be in such a form as to give the Council the maximum of information and the minimum of labour to enable them to bring them before the general members in a clear concise manner for their ruling, is carried out. It was with this in my mind, knowing the power which the representatives of a large and wholly united industry such as ours can bring to bear, that at the commencement of this address I asked all of you who are not yet members to join the Institution of Gas Engineers, in order to become one atom of what I hope some day to see—viz., a famous and irresistible organization. It was also with the future possibilities in this direction in view, that I was so anxious to see the amalgamation of the two then existing Societies brought about, because, though I am aware that we have a Gas Companies' Protection Association, and I am equally aware that it has done good and lasting work, yet I venture to say that the Protection Association which is required, which will have the greatest power for good and also the most far-reaching effect, is the Institution of Gas Engineers itself. But the necessary preliminary work must be done for them by us, and for us by our Commercial Section. It is here again where the advantages of affiliation come in, by bringing about a closer and more intimate relation with the parent Association, its Council, and its work, and enabling members, through their representative, to have a voice in the conduct of the affairs relegated to that Council, and by having the opportunity, after full consideration of any question, of laying this, through the same channel, before that body, and, through them, if necessary, to other District Associations.

To pass to more general subjects, there is one matter which will come before you at some future meeting for your consideration and decision. It relates to the Manchester and District Junior Gas Association. They have approached your Committee with a view of obtaining your assistance in aid of a scheme for enlarging the educational facilities afforded to their members. In addition to the reading and discussion of papers, lectures, &c., at their meetings, and visits to works, they are anxious for facilities to be afforded to them for improving themselves in their chemical studies by practical experience in other works. Many of them, as you know, are engaged at places where there is no chemical laboratory, and they ask for our co-operation by allowing their members to pay periodical visits, in numbers as may be arranged, and, under the supervision of the Chemist, to carry out for themselves the various general and necessary tests of a large gas-works. I feel that these Junior Associations are doing a good work, and sowing the seed of future prosperity for the gas industry of this country by preparing and training their members to habits of thought and research; and as our places, as we fall out of the ranks, will have to be taken by such men, I feel that it is a duty incumbent upon us to give all the possible assistance and facilities we can to ensure that the training shall be of the best and most useful kind, and such as will enable them to carry forward the banner of progress with unfaltering step, and at even greater speed than we ourselves have done.

Their scheme, which we have asked for, is not yet formulated; but I trust that, when it has been before your Committee for approval and is then submitted to you, it will meet with your hearty co-operation. Personally, I think that we might even go farther than simply the chemical side, and place facilities in their way—of course, always under proper regulations—for studying the engineering and management side also. The opportunities for seeing engineering extensions carried out on a large scale come very rarely indeed to many of them, and then only for perhaps a flying visit. If these opportunities could be made of such a character as would enable them to watch the progress and to make notes as to how, and what the method was in which such works were carried out, they would be much more capably fitted to take up a higher position, and would start upon the duties of that position from a much higher standpoint of knowledge. The same arguments apply to other branches of our profession, which we might open out to them in a similar way.

One cannot close without saying something with regard to the International Exhibition held last November and December. Many of you went, and could endorse the universal meed of praise which it received. The numbers and variety of the exhibits was a revelation. Many of them were not generally known, and others not even on the market. It tends to show that twenty years is too long between exhibitions of this class, and that this period should be materially shortened in the future; so that we may have the opportunity of more frequently coming across and examining the work of others labouring in the same field as ourselves. The mutual contact would undoubtedly be beneficial to all concerned, and would stimulate the inventive faculties of us all.

I am somewhat afraid that I have not made myself as clear on some points as I should have liked; but if the members of this Association, or its Commercial Sections, consider that there is anything, more especially in regard to the tables, which would repay discussion, I shall be happy to follow the example of Mr. R. Porter, of Elland, on a previous occasion, and have as much of this address as may be required re-opened at one of our future meetings for explanation or debate.

Once more I thank you, gentlemen, very sincerely for the honour you have conferred upon me, and for the patience with which you have listened to me, and I trust that our forthcoming year will be an interesting and instructive one.

Mr. Brearley said it was his privilege to propose a hearty vote of thanks to the President for the excellent address which he had just delivered. In his closing remarks, the President said he was quite ready to throw the address open for discussion. He did not wish them to take advantage of this; but there were one or two points he should like to refer to. On looking out for a subject on which to speak, Mr. Meunier said he could only find that one branch had been left to him. He was only wondering what would be his own fate next year, when he cast about for something original to speak upon. This was a point on which he should like to obtain fruition. He had felt sometimes that he should like to borrow somebody else's chemist for a few months, because an undertaking like that with which he was connected could not maintain a chemist permanently. A great deal could be done in this way. The President had attributed the application for assistance in laboratories to the Manchester and District Junior Gas Association. He (Mr. Brearley) happened to be a Yorkshireman; and he believed the proposal emanated from the Yorkshire Junior Association. This was not by any means the first time they had had the pleasure of listening to Mr. Meunier; and he hoped that he had not yet taken the highest position that it was possible to attain to in the gas industry.

Mr. Prince seconded. The address had afforded him one of the greatest possible treats. Mr. Meunier had covered all the ground necessary. He wished him a very happy and pleasurable year of office as President.

Mr. Brearley put the resolution to the meeting, and it was carried with acclamation.

The President, in returning thanks, said he was sorry he should have made a slip with regard to the Junior Associations; but he was under the impression that the Manchester District Junior Gas Association embraced both the Yorkshire and Lancashire Associations, in the same way as their own Institution did.

Mr. R. Watson (Doncaster) then read the following paper:—

SOME STREET LIGHTING RESULTS.

In bringing before the Institution some tests of public lamps, the author does not wish to ignore the very useful paper contributed two years ago by Mr. Fowler on the measurement of illumination. That paper might well be taken as a needed

stimulus to the study of outdoor lighting. The exigencies of ordinary traffic, the increased risks due to tram and motor locomotion, and, too, the insensible requirement by the public of higher standards of illumination, suggest the necessity of a more general examination of street-lighting methods.

The study has been in the past tedious and troublesome, if not neglected, in consequence of the unsatisfactory devices which were available. Recent improvements, however, have altered this, and now render the work comparatively simple. Modern portable photometers, while not providing exact means of determining absolute candle powers *in situ*, sufficiently permit of accurate results where illumination effect at any particular spot is concerned. This, after all, is the desired end. The mere statement of the power of a light in candles is insufficient for street purposes. It goes without saying that the available illumination from any source must depend upon a number of circumstances modifying, and frequently supplementing, the initial candle power value. The height and position of the burner, the direction of its light rays, the kind and use of lantern and reflector, the proximity of buildings and walls, and the nature of the object illuminated—all have their effect; and it is in the estimation of these that street photometry becomes both useful and necessary.

For the purpose of getting some data on these points, in view of street lighting alterations and improvements, the author has from time to time devoted attention to an examination of the lighting in his district. With the possibility of the work being of general interest and service, particulars of the results obtained are now submitted. It will be seen that all calculations of foot candle value have been made on the simple basis of the law of "inverse squares;" the cosine law correction being ignored. There is, of course, a material difference in the expression of values by these two laws, the one being a statement of the illumination received by a surface placed at right angles to the light rays, and the other by such surface lying obliquely to those rays. It is obvious that in the first case the full benefit of the light is derived; the actual illumination being that of the light expressed in candles divided by the square of the distance stated in feet, as shown by the equation: Illumination $= \frac{\text{C.P.}}{(\text{Distance})^2}$. In the second case, much less illumination is available; the light rays being subject to the law of inverse squares, and also proportional to the cosine of the angle they happen to make with the normal to the illuminated surface. This is shown by the formula: Illumination $= \frac{\text{C.P. cos. } \theta}{(\text{Distance})^2}$.

To give the matter concrete form, assume a piece of newspaper lying midway between two incandescent lamps 120 feet apart and having double 80-candle power burners 11 feet high. With the paper raised so that its surface is at right angles to the light rays from one lamp (those from the other being unavailable), the amount of illumination received would be 0·043 foot-candle, as indicated by the law of inverse squares. If the paper, on the other hand, is lying flat on the ground, its surface will be illuminated by both lamps giving each 0·008 and together 0·016 foot-candle, in accordance with the second formula. The latter method can scarcely be said to apply to the determination of illumination effects in ordinary thoroughfares, though it becomes eminently useful in the case of railway platforms, quays, road surfaces broken by trenches or holes, and the like.

The light of greatest service in most streets and open spaces is that which enables one to see not only the pavement, but people, vehicles, walls, steps, curbs, and other objects, the faces of which are nearly at right angles to the light falling upon them. This useful illumination is best computed by the law of inverse squares without reference to the cosine law. The two methods—the one covering the direct light from one lamp, and the other the oblique light from two lamps—have been indifferently used, rendering comparison of results difficult. In one recent instance, indeed, foot-candle lighting curves have apparently been plotted by a happy combination of the methods of both laws. The results seem to have been obtained by testing the direct light from each of the sources and then adding them together for the full lighting curve, as if both were available at the same time and obeyed the cosine law. Naturally, the curves indicate exceptionally good illumination effects.

With reference to the general question of lighting practice, it may be said that there are no recognized standards of illumination for any particular class of streets or spaces; and those adopted necessarily depend upon the views, as well as the finances, of the lighting authorities concerned. Considerable variation, therefore, exists up and down the country; and where perhaps 0·01 to 0·02 foot-candle may be suggested as sufficiently low figures for minimum illumination between two lamps, there are many instances in which the actual results are far below these values. It may not be uninteresting, however, to take two cities mentioned in the recent Glasgow public lighting report—Leeds and Bradford (sufficient data of which places only being given)—as examples of street lighting practice. In Leeds (according to this report), double No. 4 Kern burners, spaced 120 feet to 150 feet, or (say) an average of 135 feet, apart, are used in some of the principal streets, with three burners at crossings. The minimum illumination therefore between 2-light lamps would, on the basis of the lighting curves submitted, be from 0·04 to 0·05 foot-candle. In the Bradford main streets, double "C" or No. 3 Kern burners are employed, and, with the shorter spacing of 120 feet, the minimum illumination works out at about the same foot-candle value. In the main parts of both cities, however, actual illumination would probably be assisted by the light coming from lamps similarly spaced on the other side of the street. In the outskirts, both Leeds and Bradford employ a single No. 3 Kern burner in lamps about 240 feet apart, giving an approximate minimum illumination of 0·005 foot-candle.

Turning to the author's own district, fuller particulars, however, can be given. The chief streets of Doncaster are lighted by 3-light clusters of No. 4 Kern burners fitted with 4½ cubic feet governors and "A.V.I.L." fittings in hexagonal lanterns. The burners are about 11 ft. 6 in. high, and spaced at an average distance of 123 feet—the latter measurement being taken diagonally from lamp to lamp, as few streets are of uniform width. The minimum illumination between these lamps would be from 0·05 to 0·06 foot-candle, and is both ample and satisfactory. The remaining main thoroughfares are lighted by 2-light similar burners; the spacing being in one central street about 105 feet, and in the others an average of 164 feet. All are tramway routes. The minimum

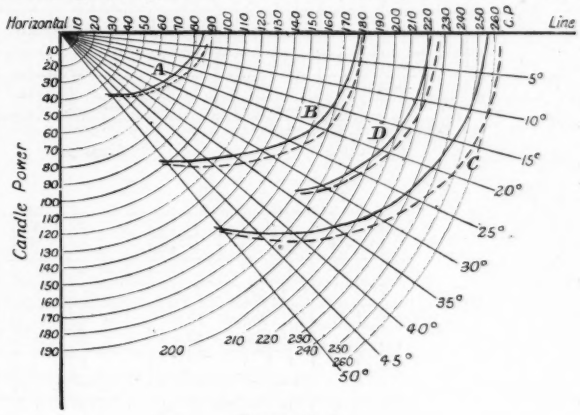


DIAGRAM A.

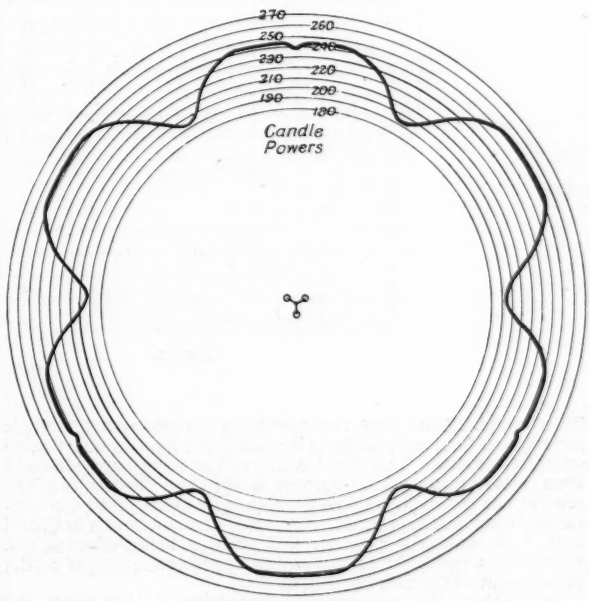


DIAGRAM B.

illumination effects, which are adequate, work out at 0·05 and 0·025 foot-candle respectively. In other streets, out of the region of shops, single incandescent burners, fixed 11 feet high in square lanterns, are in use. The lamps average 138 feet apart; and the minimum lighting between them, of about 0·015 foot-candle, is sufficient for the purpose. While incandescent burners are employed at nearly all corners of side streets, a number of the latter are still lighted by flat-flame burners. The spacing averages about 164 feet; and the minimum lighting obviously works out low—about 0·0024 foot-candle—as it must do all over the country with a method of illumination which should now be obsolete. These ordinary lamps will sooner or later be converted to the incandescent gas-light system. Several intensified burners are in use; but they are not part of any regular scheme of lighting.

As a contrast to the borough lighting, it may be remarked that in two of the outside districts which are lighted and maintained, although not otherwise controlled, by the Gas Committee, the lamps are spaced at average distances of 260 feet and 220 feet respectively. Most of these are still fitted with ordinary flat-flame burners, giving approximately 0·001 to 0·0013 foot-candle minimum

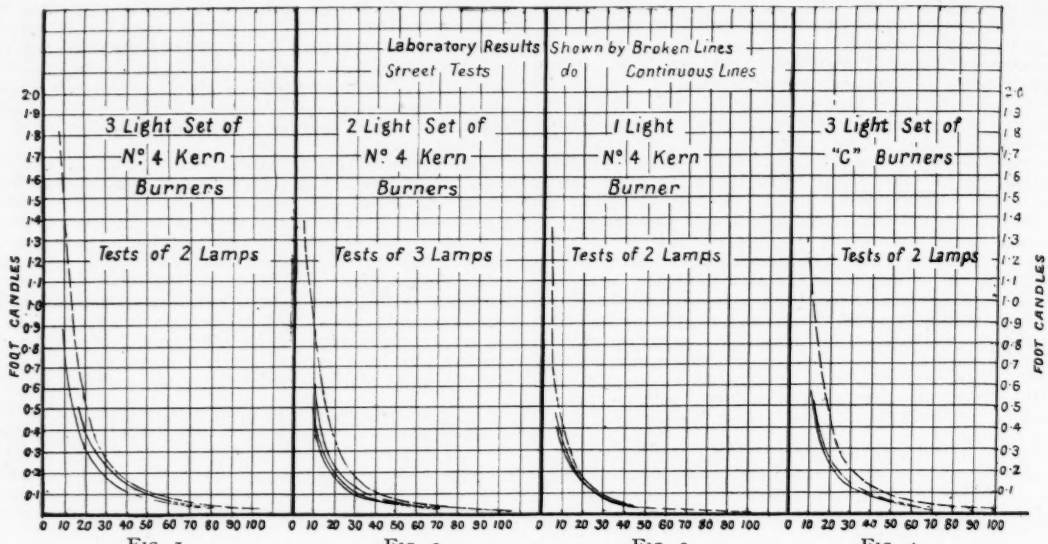

Laboratory Results Shown by Broken Lines
Street Tests do Continuous Lines
3 Light Set of N° 4 Kern Burners
Tests of 2 Lamps
2 Light Set of N° 4 Kern Burners
Tests of 3 Lamps
1 Light N° 4 Kern Burner
Tests of 2 Lamps
3 Light Set of "C" Burners
Tests of 2 Lamps
FOOT CANDLES
FOOT CANDLES

FIG. 1. FIG. 2. FIG. 3. FIG. 4.

DIAGRAM C.

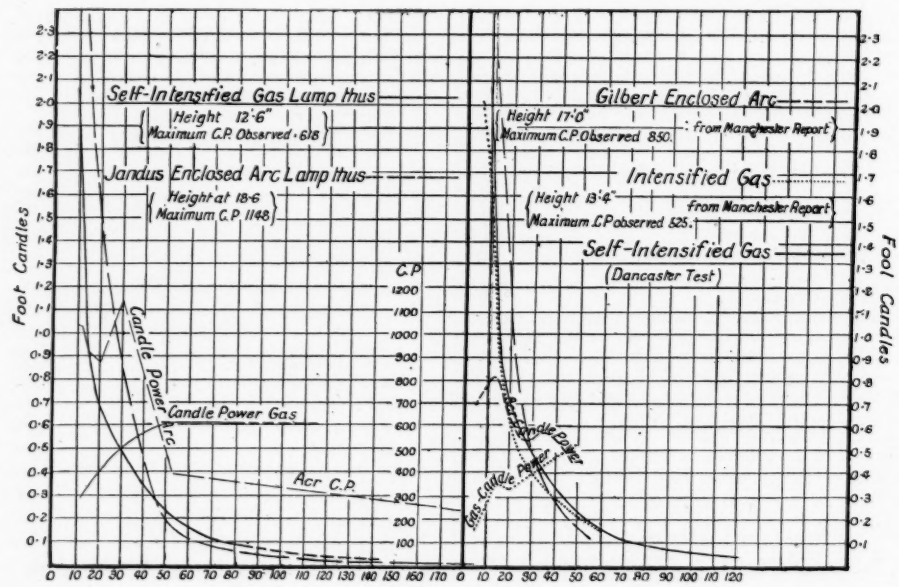


FIG. 1. FIG. 2.

DIAGRAM D.

illumination. Some, however, have been now converted to single incandescent burners, bringing the minimum lighting effect up to 0·006 foot-candle. The illumination values have been obtained from tests of incandescent burners *in situ*; and the results of the several sets of readings taken from each lamp are plotted in continuous lines on Diagram A. The tests were made at a height of 4 ft. 6 in. from the ground; this position being adopted not merely as a convenience, but as the approximate height of the line-of-sight of the average pedestrian.

In detailing the conditions of Doncaster street lighting, the minimum foot-candle values have alone been stated. The maximum illuminating effects, however, can, in each case, be seen from the plotted curves. The contrasts between the lighting results obtained at points near and midway between the lamps are at once noticeable, although these do not appear so marked in the street itself. This is probably due to the fact that the high values are only reached comparatively close to the lamp-post and soon die away into a more equal illumination. It is a point, notwithstanding, for lighting engineers to determine whether this wealth of light cannot be distributed by better designed reflectors. Prismatic globes or panes may to some extent help in diffusion; but their adoption and maintenance are too expensive. The sharpness of lighting contrast is more noticeable with high units of light if these are spaced widely, and it is particularly so in the case of arc lamps, in which, as will be seen presently, the trouble is accentuated.

For the purpose of indicating what might be expected in the streets, and also of checking results, various laboratory tests of incandescent burners have been made. The burners and manties were taken indiscriminately from stock; and as mantles, at any rate, vary in quality, the readings were simply those of the various samples taken, and might have been better or worse accordingly. The tests were carried out at a uniform gas consumption of approximately 4·2 cubic feet per hour, under like conditions, and at angles varying 10 degrees from the horizontal line downwards to 50 degrees. They were made, too, with and without reflectors, not only to show the benefit of a reflecting surface, but to indicate any allowance which should be made for dirty or discoloured lantern reflectors. The mean readings of the candle power of the several burners singly and in clusters are shown by curves on Diagram B.

The reflector in use with the 2-light and 3-light sets was slightly concave in the centre, dying off on to a flat surface—a combination frequently adopted in street-lanterns. The resulting curve plainly shows its utility, but suggests that its design might, with advantage, have been modified so as to increase its effect nearer the horizontal line. Better distribution is shown in the case of the single burner, during the test of which an annular convex reflector was employed. Although, with two or three exceptions, no "C" burners are employed for street lighting, the results of tests of these are also included. Even when taking into account the smaller gas consumption, their efficiency does not seem to equal that of Kern burners. It will be noted that the candle powers of all the burners increase as the direction of light rays approximate to the horizontal—a fact which decidedly makes for effective distribution, and, as between light and light, gives the incandescent gas-burner a material advantage over the arc lamp. As is recognized, the candle powers of the latter are greatest at angles of 25 degrees within limits downwards, and diminish, on the other hand, to practically nothing as they approach the horizontal, where, obviously, they would be of more service. In the latter connection, the following data, showing the candle power of the Jandus enclosed arc lamp, are perhaps worth quoting from "Fowler's Electrical Year Book." The lamp, tested on 110 volt

circuit, took an average current of 5·5 amperes, and clear globes were used.

Mean for Two Sets of Observations at Various Angles.

Angle of Depression.	British Standard Candles.
3° 30′	189
15° 0′	396
25° 30′	1,148
34° 30′	869
41° 45′	920
47° 45′	1,025
52° 43′	1,032
56° 43′	1,035
60° 0′	931

The candle power between the angle of 25 degrees and the horizontal line should be noted, explaining as it does the dark spots midway between arc lamps where these are at any distance from each other. The effect can perhaps be better seen in the calculated lighting curve of the lamp on Diagram D, fig. 1.

From the results obtained in the laboratory tests of incandescent gas-burners with reflectors (see Diagram B), lighting curves have been plotted on to Diagram A for the purpose of comparison with those of actual street-lamp testing. These are shown by broken lines. That the actual curves do not come up to the photometrical tests might be expected, considering the fact that street-lanterns are not laboratories, and the conditions generally are not so favourable. The gas consumption, too, in the case of the street-burners, is unlikely to be the same as that in the check tests. Several lamp-meters are in use in the district; and the average consumption per burner per annum works out at slightly under 4 cubic feet per hour. It is probable, however, that the actual burner consumptions from hour to hour during any evening rise and fall with the works' pressure, and the figure given will therefore be a mean.

The tests have in every case been made with all burners placed in full view, since where one burner is fully or partly obscured by another, the available light is materially diminished. This is shown by Diagram C, which gives the result of a horizontal circular test of a 3-light burner cluster. The burners were supported on an "A.V.I.L." frame with three radiating arms, and were each 2½ inches from the centre rod. It will be seen that, when one of the burners was half eclipsed, the light dropped from 252 to 222 candles, and when fully hidden to 193 candles. By keeping the burners of any cluster a few inches from each other, this drop, however, can be considerably minimized. The point is an important one, and it cannot be disputed that, where close clusters of three, four, and five incandescent burners are used, as is the case in some towns, the light of one or more of them is practically wasted, since eclipse takes place in every direction.

Diagram D, fig. 1, includes a lighting curve, plotted from a test made *in situ*, of a 700-candle power self-intensified lamp. This has been placed against the theoretical curve of the arc light already referred to, although the shown maximum candle power of the latter is nearly twice that of the gas-lamp. Over these curves of illumination effect, further curves have been drawn showing the respective candle powers of the two sources of light, which, subject to the law of inverse squares, would be utilizable at any particular distance. The curves of the arc lamp are taken from point to point for want of fuller data. The contrasts of candle power and illumination effect are, to say the least, interesting. The flood of light (disregarding comparative costs) obtainable from the arc for a certain distance from the lamp-column is undoubted, and excels that from the high-power gas-lamp; but the sharp and rapid fall of the available illumination a little further away soon reverses their relative importance so far as foot-candle values are concerned. Better distribution from the arc lamp might follow probably if opal or opalescent, instead of clear globes, were used; but in this case the candle powers themselves would have to be discounted in consequence of the resulting obstruction of light.

As the recently published report on Manchester street arc lighting gives the illumination curve from tests *in situ* of a Gilbert enclosed lamp, having presumably an opalescent or similar globe, the liberty of reproduction has been taken. The lamp in question was rated with about the same current consumption as that already quoted—in this case 6 ampères at 100 volts—and the depreciation of the laboratory results can therefore be readily seen. The curves of both candle power and illuminating effect are plotted in broken lines on Diagram D, fig. 2, against Doncaster curves of the self-intensified gas-lamp; and it will be noted that they practically exhibit the same characteristics as those shown in fig. 1. It may be advisable, however, to reproduce also the lighting curves of the intensified gas-lamp given in the Manchester report by way of confirmation. These are shown in fig. 2 by dotted lines. The contrast between arc and intensified gas lighting is the more striking when it is remembered that the report credits the arc with a maximum of 850 candle power, and the intensified gas-lamp of 525-candle power only. The maximum observed in the Doncaster case was 618 candles.

In conclusion, it remains to be said, with regard to the subject-matter of this paper, that the author's tests of incandescent burners have been made with the bar photometer fitted with a 10-candle pentane standard and the Simmance-Abady "Flicker" device, and those in the street with their portable photometer to which the same flicker arrangement was attached. The street photometer was fitted with a 1-candle pentane standard; but as this became relatively too large for the determination of foot-candle values away from the immediate neighbourhood of lamps, a brass chimney was used, having two sliding shutters adjusted to allow 0·25 candle light to pass—the whole arrangement being standardized against a laboratory 10-candle pentane standard.

The "Flicker" system of photometrical reading, affording definite comparison between lights irrespective of colour, is now fairly well known, and needs no description. It is sufficient to say that its use begot a confidence which was not possible with the greased disc previously employed in earlier work done both on the bar and with the portable photometer.

Discussion.

The PRESIDENT said he must congratulate Mr. Watson very heartily on his paper, and himself on the fact that the first paper contributed under his watchful care should be not only one so highly interesting, but one which was so valuable as dealing with a point which had often been debated about in the dark, though there had been very few attempts made to come to any definite conclusion.

Mr. TOWNSEND wished to be the first to congratulate Mr. Watson upon this very excellent paper, because it had been read at his express request. He must say that the paper had far exceeded his expectations in the matter, and would be very valuable and useful for future reference. Two years ago, a paper of a somewhat similar character had been read; and to the best of his recollection that and the one they were then discussing were the only technical fare on this important point. He thought this was a great feather in the cap of the Institution. Mr. Watson had brought the question of illuminating effect down to fixed principles. A few years ago, it was his fortune to have to accompany the Lighting Committees on inspections of their districts; and he found the predominating idea of these Committees was to put up lamps in their various wards. When they got in one particular man's ward, up went the lamps; and the same with the others. Mr. Watson had now shown him an excellent method to adopt when they had to decide whether they were going to have 0·05 candle or 0·005 candle; and he thought this would lead to improved results. It was almost impossible to criticize a paper of this character at a moment's notice. They had none of them seen the diagrams before that afternoon; and, therefore, he would not venture into the realms of criticism, but should content himself with thanking Mr. Watson for having contributed this valuable addition to the transactions.

Mr. BREARLEY said the paper brought out one or two important issues. In the first place, it brought before them the fact that the street lighting of the present day was very inadequate. Taking the experience which had been related with regard to Doncaster, it would seem that it was only in the central thoroughfares and the tramway routes that the lighting was anything like what it should be. But, notwithstanding this, Doncaster was considerably better off than the majority of places. Mr. Watson stated that he considered that in the rural area a 0·015 foot-candle was sufficient for the purpose. He (Mr. Brearley) thought this was scarcely the case, because it was assuming that the mantle was all right. It was found that the accidents to mantles were too frequent to be pleasant in some districts, and 0·015 foot-candle was too low a minimum to safeguard the traffic in the streets. In his own case, the lamps were quite 240 feet apart. He had not yet tested the illuminating power by the portable photometer; but, taking Mr. Watson's basis of calculation, they would be getting about 0·0031 foot-candle in the centre between the two lamps. This was not what it should be. The difficulty was to rule the Rural District Councils—and the Urban District Councils too, for that matter—in these things. They were allowed to increase the light as much as they pleased, so long as they did not add to the cost; but they must not suggest anything which would tend to increase the lighting bill. This spirit of economy seemed to make its appearance when it should not do so; and when it should, it failed. One of the points on which economy was exercised to too high a degree was in connection with street lighting. After reading the paper on the previous evening, he took a walk and stood between two flat-flame burner lamps 80 yards apart. He wondered whether Mr. Watson had taken his tests with the portable photometer situated midway between two burners of this kind, because, if he had, the marvel was not so much that he could see the reading on the photometer, but that he could see the photometer at all; and it struck him that it would be utterly impossible to take a reading at that point.

Mr. T. NEWBIGGING said he was afraid, when he read this paper, that there would not be much discussion upon it; and, therefore, he had taken the trouble—or rather he should say, he had had the pleasure—of jotting down a few remarks, because he did not wish it to go before the gas world that the members of the Institution could not discuss any paper that was submitted to them. He had both read and listened with interest to Mr. Watson's paper. It was very satisfactory to observe the progress that was being made by the younger generation of gas engineers and managers in the technical work of their profession. Let any gas manager adopt the practice of personal, regular, and careful experiment, and he would never find time lie heavily on his hands. If the same process of observation, experiment, and analysis was brought to bear on all the other details of gas manufacture, it augured well for the future of the industry. But, of course, if a gas manager was to fully grasp the subject, and have

it so impressed upon his mind as to admit of his explaining it, or discussing it to advantage, either with his brother managers or his directors or committees, it was desirable that he should make the actual determinations for himself, with the burners he employed and the gas he produced. He agreed with Mr. Watson that it was best to apply the law of inverse squares pure and simple, rather than the cosine law correction, under the ordinary conditions of public lighting. In places liable to the dumping of impedimenta of any kind, or of permanent obstructions or dangerous points, the cosine should be introduced into the calculation. In such cases, of course, the lamps should be ranged at shorter distances apart, if the proper illuminating effect was desired. It would be gathered from the paper that the illuminating effect in street lighting was about six times greater with the single incandescent-gas burner than with the single flat-flame burner. It was not so stated in so many words in the paper; but that was the result, taking Mr. Watson's figures. Mr. Watson did not state the illuminating power of his gas, nor the number of cubic feet consumed by the flat flame to which he referred. But, again calculating backward, he found that these were 5 cubic feet and 16 candles respectively.

Mr. WATSON said it was stated in the paper as 5 cubic feet.

Mr. NEWBIGGING said he had failed to notice it. He had arrived at it by calculation; and it was just as well that it should be stated, if it was not. He noticed a slight mistake in a figure in the sixth line of the fourth paragraph, where 0·043 should be 0·045. It was really 0·0444; but ignoring the fourth decimal, it might be stated as 0·045. It was of little consequence; but it might as well be put right. The figures given by Mr. Watson as to the illuminating effect at the midway point between two street-lamps were theoretical or calculated. They must not run away with the notion that Mr. Watson had actually verified the figures by means of his photometer, as Mr. Brearley seemed to think. It must have been calculated, as it would be impossible to get it otherwise. But no account had been taken of the assistance given by reflection from buildings. Roughly, he should say that the difference caused by this reflection would add one-quarter or one-third—from 25 to 33 per cent.—to Mr. Watson's figures. For country roads where no assistance was given by reflection, the figures would be exact; and it was in country roads where the lamps should really be nearer together, whereas as a rule they placed them farther apart. There was just one other point to which he might allude, and that was the widely growing use of the term "illuminating effect." He took some credit to himself in having popularized, if not in actually having introduced, the expression which was now so extensively used both in this country and by gas engineers abroad. Prior to the reading of his paper on "Illuminating Power and Illuminating Effect" before the Gas Institute in 1894, they would almost look in vain for the term in the technical journals or in papers dealing with illuminating values. He might as well mention one other fact (though he did not know that it bore on the particular paper then under discussion) that was dealt with in the contribution to which he had just referred, and that was that he then strongly advocated the reduction of the statutory illuminating power, and was taken to task about it, not only by his North Country friends—which was not altogether surprising—but by certain English gas engineers. The Scottish gas managers were particularly bitter with him—fit, indeed, to jump down his throat—for daring to question their inflated values; and yet to-day they, or most of them, were tumbling over each other as to which of them should be loudest in his advocacy of the very thing for which they anathematized him. They lived and learnt, and it was very well that they did; for to continue impenitent was to be in a sad case.

Mr. HUTCHINSON said it seemed to him that Mr. Watson's admirable elucidation of some of the matters showed very clearly how it was there were so many misunderstandings in the streets of Barnsley. The principal street was lighted by the electric arc light. This gave rise to many misunderstandings, for when passing that lamp it was impossible to discern one's best friend.

Mr. WATSON regretted that he had not much to reply upon. In answer to Mr. Brearley, he had thought that it was scarcely worth while to go into the question of flat-flame burners. He had made a test of a two-light flat-flame burner; and he found that the illumination a certain distance from the lamp was so comparatively low that readings were impossible. He wished to thank Mr. Newbigging for his remarks. He remembered that Mr. Newbigging contributed a paper some years ago which was not only interesting, but instructive and useful. He accepted Mr. Newbigging's correction with regard to 0·045 being the right figure in place of 0·043; but he did not think it made any difference to the illustration, as such.

Mr. NEWBIGGING: No, it does not; but it might as well be right.

Mr. WATSON said he wanted to put the matter in a concrete form; but the Kern values were not taken from actual tests. He had not made any test to show the effect of reflection from street walls and houses. If there was an effect from the houses and walls it would be modified the further one went away from illumination; though he had not had any opportunity of testing whether it was as great as 25 per cent. or 33 per cent. In conclusion, he wished again to thank the members for their kind appreciation of, and attention to, the paper.

[Mr. WATSON has since written: "I find my calculation of 0·043 foot-candle—questioned by Mr. Newbigging—to be perfectly correct. Mr. Newbigging's figure of 0·045 has apparently been obtained by dividing the candle power by the square of the *base*, instead of the *hypothenuse* of the triangle formed by the burner, the object illuminated, and the lamp-column foot."]

VOTES OF THANKS.

Mr. TOWNSEND then moved that a hearty vote of thanks be given to Mr. Watson for his paper, which he was sure the members had all highly appreciated. Now that Mr. Watson had shown his quality, he hoped the Institution would be still further indebted to him on future occasions.

Mr. W. S. HADDOCK (Warrington) seconded the proposition, and it was carried unanimously.

Mr. WATSON returned thanks for the resolution so kindly passed, which he assured the members he highly appreciated.

Mr. MOTTRAM had great pleasure in moving a vote of thanks to the officers and Committee for their services during the past year. He was sure the affairs of the Institution had been excellently managed. Every part of the large district had been well catered for; and the Yorkshire members had certainly nothing to complain of.

Mr. E. H. HUDSON (Normanton) seconded the motion. They had had a very good year; and the Committee must have worked very hard in bringing such useful matter before the members. Of course, he expected it when his neighbour, Mr. Townsend, became President. He felt sure they were all, from the President downwards, including the Secretary, a capable set of officers.

The resolution having passed unanimously,

Mr. BREARLEY returned thanks on behalf of the officers. He had done what little he could to further the administration of affairs. He was looking, only the day before, at the number of meetings he had attended during the last year; and while he might not have been of much use, there was something in counting heads. Besides other meetings, he had attended every meeting of the Commercial Section, to say nothing of meetings of the Junior Association.

Mr. NEWBIGGING also returned thanks. As the members must be aware, he was the permanent Treasurer; but it so happened that on the present occasion he had not a farthing to treasure. He was completely out of funds. Although his duties were so small and trifling in connection with the treasurership, it must not be forgotten that he attended the Committee meetings and contributed in that way as much as he possibly could towards the success of the Institution in which he had always taken great interest. Every year they seemed to get busier, and the work that crowded upon the Committee was something surprising. More difficult points came before them to which they had to give close attention; and he believed they all tried to do their duty in this respect. The work that fell upon the Secretary was heavier than any of them could imagine; and he was sure that this gentleman, at least, deserved a vote of thanks, whether the other officers did or not. He was glad to see the Secretary in better health than he had been of late, and hoped he would continue to improve.

The PRESIDENT said that, irrespective of the vote of thanks to the officers and the Committee, he certainly thought their Secretary deserved one all to himself. He, therefore, had great pleasure in moving that their heartiest thanks be given to Mr. Kendrick for his services during the past year. How heavy those services had been only those who attended the Committee meetings could realize. The Question-Box business, whenever it came to pass, would mean an increase of 25 to 30 per cent. in his labours. If Mr. Kendrick was willing to face the task, they were only too glad to have his services.

Mr. TOWNSEND seconded. He had had a great deal of experience of Mr. Kendrick during the last twelve months; and he must say that the work that fell to the lot of the Secretary was far greater than that imposed upon many a highly-paid official. They were under a great deal of obligation to Mr. Kendrick for performing his onerous and important duties.

The motion was put and unanimously agreed to.

The SECRETARY, in returning thanks, said that whatever he had done for the Institution was done willingly; and the same remark would apply to what he might do in the coming year. All he asked for was to have the support of the members.

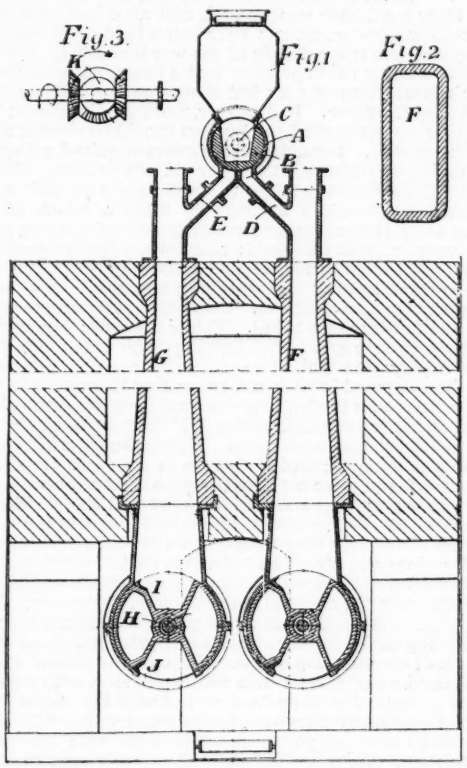
This concluded the business, and most of the members remained for tea and a smoking concert during the evening.

Northern Star Lodge.—The meeting of this lodge for the installation of the W.M. and the investure of officers for the present year was held on Friday last at the Midland Hotel, Manchester. There was a large attendance of members and many visiting brethren. The W.M. (W. Bro. R. G. Shadbolt, of Grantham) was duly installed—by W. Bro. J. W. Broadhead, of Elland—in succession to W. Bro. John Niven, of Clayton, who was appointed at the consecration of the lodge last November. The other officers were: Bro. Samuel R. Ogden, of Blackburn, S.W.; Bro. W. Prince, of Stoke-on-Trent, J.W.; Bro. Harrison Veevers, of Dukinfield, Treasurer; Bro. S. S. Mellor, of Northwich, Secretary; Bro. W. Taylor, of Glossop, S.D.; Bro. Robert Surtees, of Fenton, J.D.; Bro. J. S. Naylor, of Manchester, I.G.; Bro. T. Duxbury, of Darwen, D.C.; Bro. James Gibson, of Leigh, Organist; and Bros. Jno. C. Pennington, of Colwyn Bay, H. J. Robinson, of Mossley, John Mackay, of Bradford, and G. B. Smedley, of Swadlincote, Stewards. There was a banquet at the close of the lodge.

VERTICAL GAS-RETORTS IN FRANCE.

The Verdier-Teulon System.

We learn from the current number of the "Journal d'Eclairage au Gaz" that MM. Jules Verdier and Pierre Teulon, of the Marseilles Gas-Works, have been carrying out some experiments with a setting of vertical retorts, arranged as shown in the accompanying illustration, fig. 1. It is very much on the lines of the Settle-Padfield system, and the advantages claimed for it consist in the employment of small charges frequently repeated, by which sudden cooling of the retort, which causes its rapid deterioration, and loss of heat and retardation of the distillation process, are avoided. By preventing air from entering the retort, the total recuperation of the gases is assured. Furthermore, owing to the conditions of manufacture, the coke produced is of better quality. The space left above the coal in course of carbonization facilitates the gasification of the products of distillation, particularly the decomposition of the tar. It is claimed that in this way a greater yield of gas than is usually obtained is ensured.



The arrangement adopted by MM. Verdier and Teulon consists of one or more vertical retorts, either cylindrical, surmounted by a truncated cone-shaped portion, or of the section shown in fig. 2. Referring to fig. 1, the hopper is an iron receptacle placed on the top of the setting. This hopper can be filled by means of any suitable conveyor; and it delivers the coal into a charger composed of a cock A, of which the plug B is furnished with a cavity C, which is filled with coal when in the position shown in the illustration. This plug has an oscillating motion imparted to it by some suitable device, causing it to empty its contents alternately into the channels D and E, and thus feed successively the retorts F and G. The discharging arrangement, which is equally simple, also consists of a kind of cock of large dimensions H, the plug of which has two cavities, I and J, placed symmetrically with the axis. The discharge-cock has an alternating motion by which the coke is brought down first on one side of the retort and then on the other. It is caught by a conveyor, which may be the "return" of the one feeding the hopper. This arrangement makes it possible, by the aid of a single motor, to convey the coal, charge and discharge the retorts, and remove the coke from the retort-house, with the minimum amount of manual labour and machinery. The alternating motion may be given to the plugs B or H by the device shown in fig. 3. The cog-wheel K, rotating continuously in the direction indicated by the arrow above it, gears into the two other cog-wheels shown. A toothed wheel transmits motion to the axis of a plug by means of a chain. The wheel K having cogs on a small portion only of its circumference, the shaft will be turned in the direction of the arrow shown upon it when K is in contact with the left-hand wheel, and when it gears into the right-hand wheel the shaft will revolve in the opposite direction. The capacities of C and I are calculated so that, with given speeds, the latter will discharge a bulk of coke corresponding to the quantity of coal delivered by the former, within the same space of time.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The Question-Box.

At the Monthly Meeting of the Association, which was held at the Regent Street Polytechnic last Friday—the President (Mr. Walter Grafton) in the chair—a number of questions sent in to the Secretary by the members were discussed at considerable length. The queries are given below, together with a summary of the replies that they evoked.

The first question was: "When letting down a regenerative bench for a few hours, is it best to reduce the primary air or to shut the damper, allowing only enough air to keep the furnace from going out?" Mr. Dean said it all depended upon what was called "a few hours." If it was from one to six, or even from one to twelve, he should not advise the reduction of the primary air, but merely the closing a little of the main dampers. Mr. Clarke thought that if the primary air was shut off, it would cause an excessive strain on the walls of the setting. It seemed to him that the best thing was to check by means of the main damper. Mr. Winslow believed they would find that in the majority of cases the primary air supply was hardly ever touched after it had been fixed for the setting; it would be a job to go round and alter it. The President said that most of the speakers had dealt with a setting; whereas the question distinctly referred to a bench, which he took it meant a number of settings united together. No one would think of closing a number of primary air supplies where a single main damper would do the whole thing. Then, again, it was clearly a question of time. What did "a few hours" mean? Was it a shift of eight hours, or less, or a day or a week? This was an important point; and unless it was made clear, the question could not be properly answered.

Question No. 2 was: "How is coal gas and carburetted water gas mixed to get the best results?" Mr. Upton remarked that the fact of carburetted water gas being mentioned did away with all reference to any of the blue water-gas systems on the lines of Professor Lewes's, of which so much was heard nowadays. It would be better if some of the queries were put more plainly. For instance, if the relative candle power of the two gases had been given, it would have enabled more information to be supplied in reply. Taking it that the gas from the carburetted water-gas plant was poor in benzol, and that from the benches was rich in it, he could only think that if the gas that was poor was added to that which was rich at some point before the latter had a chance of depositing the benzol with which it was saturated, this would be the best method by which the two could be mixed. Consequently, he would suggest that the answer should be that the best place to mix them would be somewhere about the hydraulic main, before one gas had time to part with that which the other could very well carry. Mr. Dean considered the query was rather vague; and he was wondering whether the writer meant in what proportions the gases should be mixed to get the best results, or in what part of the plant. So far as proportion was concerned, much depended upon the quality of the gas; but as regarded the part of the apparatus where the mixing took place, he did not think it mattered much so long as it was somewhere on the inlet side of the holder.

The next matter was: "To what extent can carburetted water gas be added to coal gas? Are there any companies using over 50 per cent. of carburetted water gas with coal gas?" Mr. Dean remarked that coal and carburetted water gas could be mixed to any extent, up to 99 per cent. to 1 per cent., so long as the illuminating power was sufficient. Mr. Upton thought that the average for London was about 25 per cent. of carburetted water gas; but in many towns in America it was 75 per cent., and in some even more than that. So that there was no limit so far as mixture went. But there were other things to take into consideration—such as candle power, &c. Mr. Vanner explained that he asked these questions, because he knew of one company using 30 per cent. of carburetted water gas who had complaints as to the two gases not mixing properly. The light was affected. When there was an excessive proportion of carburetted water gas to coal gas, must not the air supply be regulated in the case of incandescent burners? The President replied that it depended upon the quality of the carburetted water gas. In answer to a further query, he stated that it did not follow, because Kern burners hissed, that this was caused by the water gas. It must depend upon the quality of both gases as to whether the percentage of carburetted water gas must be limited so as to prevent a decrease of light. Of course, the efficiency of the burner had also to be considered. Mr. Winslow remarked that the Kern burners were very delicately balanced; and a very slight thing—perhaps a difference in specific gravity—affected them. Then, of course, they had to be altered. As the result of experiments with No. 3 Kern burners, he had found that with different proportions of coal and water gas various sized nipples were required inside them. A larger nipple was needed for a bigger proportion of water gas, owing, he took it, to the greater specific gravity of this gas. He heard of a place a little while back where the people could not understand why something had gone wrong with their burners; but, as a matter of fact, there was a slightly different proportion of coal and carburetted water gas being supplied to them. He found a

gas-fitter had put plenty of wadding round the air-holes; but this did not last long. A larger sized nipple, however, remedied the matter. It was just the same with the "C" burners. Not enough gas could get through with a very large percentage of carburetted water gas for the air drawn in. There were two alternatives—to regulate the air supply or open the gas-ways. The President said that, as regarded Mr. Winslow's experiment, everything depended upon the pressure. If he had increased the pressure, this would have overcome the difficulty, as the difference in specific gravity would have been balanced. This extra pressure could, of course, be put on at the works. Companies supplying carburetted water gas had added to their distributing pressure.

The next question was: "What are the advantages of using hot coke for feeding generator furnaces over cold coke? Is the fuel account increased?" Mr. Upton remarked that the answer was obvious. In the first place, when cold fuel was put on a fire it abstracted a certain amount of heat; and this being so, of course, the fire was cooled, which altered the constituents of the gases at once. Modern practice was to use, wherever possible, hot coke. Mr. C. S. Carpenter pointed out that, besides actual loss of heat, there was the question of convenience to consider. It would be very awkward to have to fetch cold coke in from the yard. The President said it was all a question of economy. If they put the coke in hot, the heat energy already existing in it was saved; and therefore it was so much gain, for less fuel would be required. With cold coke, it necessitated more handling, and there was, of course, a certain amount of damping down of the fire for the time being, but sometimes it was convenient to use cold coke.

Query No. 5 was: "How often should a regenerative furnace require clinkering? Does this depend on the setting, or are there any fixed rules?" Mr. Dean said that his experience of the clinkering of regenerative fires extended over rather a long time; and using ordinary Durham coals, they generally managed to get round them once in 48 hours. With some inferior coals, however, it was necessary to do the work more often, on account of the clinker getting on the furnace-bars, and thus putting the furnaces out of work for the time being. Some makers said their furnaces did not require clinkering at more frequent intervals than three or four days; but he found it was best to do it at least every 48 hours, and thus keep the fire as clean as possible. Mr. Winslow said that, of course, it depended entirely on the coal as to how often regenerative furnaces required clinkering. Once in 48 hours was a good time, though in some cases he believed furnaces had to be clinkered every 24 hours. The President said the "fixed rules" were governed by the coke used. Some coke or coals would produce a clinker which was tough and did not break away at all easily. It would be found that 24 hours would generally meet the case, with "pricking up" every two or three hours.

The sixth question was: "It is said that wet coal produces less gas, that the gas is of poor quality, and that the sulphur impurities given off are more. Why is this?" Mr. Upton pointed out that if the coal was put in wet, the moisture had first to be driven off before the carbonizing began. Consequently, the retort was cooled, and this threw more work on the setting. But more than that, the retort being somewhat chilled, when the vapours commenced to come away they were not subjected to such an extent to the action of radiant heat; so that, instead of being more or less split up to increase the gas yield, the heavy vapours went to make more tar. With dry coal, about 50 per cent. of the sulphur remained in the coke. Mr. Winslow said he should like to know whether at any time a decided test had been made to prove that the mere presence of water alone would cause more sulphur to come off. The President remarked that wet coals, of course, meant coals straight from the mine or the ship that had suffered from an excessive amount of rain, and not stored coals. If coal had been stored and was wet, they got a considerable reduction of gas, for a good deal of the gas may have already gone away, due to spontaneous heating. With regard to the sulphur impurities, there were bound in this case to be more per 100 cubic feet of gas made, because there was less gas to spread them over.

With regard to the questions—"What precautions should be taken to ensure the production of a white salt in sulphate of ammonia manufacture when the acid used is thought to contain arsenic or iron?" and "White salt sometimes discolours after storage; why is this?" the President thought it would perhaps be sufficient to refer the inquirer to an article that appeared in a recent number of the "JOURNAL" (p. 360).

The eighth query was as follows: "Although the first touch of winter gives rise to an abnormal number of stopped service-pipes, succeeding 'cold snaps' give very little trouble; why is this?" Mr. Grimwood said they all knew that naphthalene was deposited when gas cooled. As in the summer time the gas was generally hotter in the holders than in the mains, naphthalene was deposited at that season of the year; but it was not noticed until the first touch of the cold weather. Then in the winter the mains were hotter than the gas in the holders; and consequently naphthalene was not deposited at that season. This, he added, was purely theoretical; and he did not know whether it happened in practice. The Secretary (Mr. Scarth) thought the reason why it was noticed on the first "snap" was the sudden change of temperature. Later on the whole of the plant got cool, and the earth as well, and so there was not the sudden cooling of the gas that was experienced on the first "snap." Mr. Clarke said it was during the summer that naphthalene was deposited. It then had the greatest chance of getting forward with the gas, and entering the cool mains was thrown down. When the cold weather came, this was taken up and carried forward. In this way, the whole of the naphthalene might be cleared out of the mains during the first "snap;" and since no more naphthalene would come forward at that time owing to the cold weather, the mains would remain clear. Mr. Ainsworth thought that those who had to deal with naphthalene would find that the trouble with the services was principally when the day had been hot and the evening became chilly, as it did at the end and beginning of the season. Where the services were not very deep, the naphthalene then collected at once. He had known cases of services being stopped every few days on this account at the beginning and end of the season—chiefly at the end. The President remarked that something to do with this was that in summer time the pipes were not so much used. In winter the mains and service pipes conveyed more gas; therefore more crystals of naphthalene were thrown down, owing to the gas being more saturated at the lower temperature.

The ninth question was: "Is there any gain in using a long chimney (say, 8-inch) with an ordinary 'C' burner over a shorter chimney (say, 6-inch)? What effect has the chimney on the light emitted?" Mr. Ainsworth said he was sure that with an ordinary "C" burner a chimney was wanted, and an 8-inch one was the best size for general purposes; but a better light could be obtained with a 9-inch one if the supply of gas was increased. For a long time he was under the impression that a longer chimney caused a greater consumption of gas; but it was not so. There was no appreciable difference. It, however, reduced the flame; and if more gas was not supplied, the support should be shortened, so as to fill the mantle. Incandescent burners required rather more manipulating with water gas than they did with coal gas. Generally speaking, if they wanted to get the best results possible out of a "C" burner, this could be done by using a 9-inch chimney. He was sorry that many people recommended the use of even "C" burners without chimneys; and it was difficult sometimes to persuade consumers to use them on account of breakages. With regard to street lighting, this was frequently spoilt by authorities refusing to take sufficient gas. One often saw burners with the mantles half or three parts full. This was wrong; but, of course, it was done to save gas. With lighting of all descriptions, where the gas supply was limited to a certain amount, the supports should be shortened in such a manner that the mantle would be full, so as to secure the best results from the gas consumed. Mr. Dean's experience was that with a "C" burner the gas filled the burner better without a chimney. With a 9-inch chimney there was a forced draught; and if there was a governor, they were simply drawing in more air than the gas would readily mix with. If a governor passed $3\frac{1}{2}$ cubic feet, that should be sufficient to fill the mantle. Mr. Ainsworth said he meant that when increasing the length of chimney they must either increase the supply of gas or partly close the air-holes. Mr. Dean asked whether, if they had a mantle well filled without the use of a chimney, the putting on of a chimney did not reduce the illuminating power. If they increased the gas-way, it was no longer a "C" burner; for really the efficiency of this burner consisted in getting a good mixture with a small consumption of gas. With a pear-shaped globe he had obtained a better light than with a chimney, with a governor fixed for $3\frac{1}{2}$ feet. Mr. Grimwood agreed with Mr. Ainsworth that the use of a chimney did give a better result with a "C" burner. He obtained over 20 per cent. more light with the addition of a chimney. Varying the length of the chimneys made very little difference in the result. His tests were made with a fair pressure; and the consumption of gas was the same in each case—$4\frac{1}{2}$ feet. He tried chimneys 6, 8, and 9 inches long; and the same amount of light was emitted with each of them. He also tried the burner before putting the mantle on; and he could not see any variation at all in the flame with the different chimneys; though without a chimney, of course, the flame was very different in construction. Mr. Upton said the question was strictly between 6 and 8 inch chimneys; and therefore it must be taken that other things were equal. Some time ago, he made experiments with a "C" burner; and without a chimney he did not get anything like the same duty per cubic foot as with one. He tried 6 and 8 inch ones; and the 8-inch gave the better duty. He did not, however, adopt it because he preferred to sacrifice the additional light rather than have several inches of chimney sticking out of the top of the globe. The President remarked that it depended entirely on the composition of the gas used as to whether a better or worse result was obtained with a long chimney. A 6-inch chimney gave a better return per cubic foot than an 8-inch one for all classes of gas; but it was necessary to have a sleeve with it in order to adjust the air. There could not be any more gas consumed. If the burner was regulated for $3\frac{1}{2}$ feet, it only passed this quantity whatever the length of chimney employed; but the light per unit of gas would be considerably affected. An 8-inch chimney would require more gas to give the same light as a 6-inch one. Again, if the composition of the gas changed, the pressure would need adjusting in order to consume a particular quantity of gas in any chimney.

Another query put was: "To what extent are cast-iron pipes porous; and is the bitumen covering usually employed of any benefit in preventing leakage?" Mr. Vanner said that if a cast-iron main pipe was put into the ground with a covering of pitch or of Dr. Angus Smith's solution, and had an unnoticed flaw, it would go longer without being discovered than if there were no

covering on it, because the solution would bind the pipe together. In bad ground a pipe would last longer with a covering than if it were not coated. The President pointed out that a covering was very frequently put on mains, not with the idea of preventing leakage subsequently, but to hide up blemishes. When laying down a length of main, the pipes should be examined when supplied to the works. Covering was well enough; but they must be careful to ascertain first that there were no pit-holes in the pipes. It depended upon the nature of the ground as to whether such covering was really necessary; but anyway the pipes should be bought without solution, and inspected before it was put on.

The last question was: "Is there any easy method of ascertaining the specific gravity of a gas without expensive apparatus?" The Secretary thought the inquirer could make a bunsen effusion test; but, of course, the difficulty would be to make the hole in the platinum disc through which the gas would pass during the test. The President said it could be done by the aid of a delicate balance and a stoppered bottle; but the gas and air must be dry, and therefore a drying tube was needed. There was also a new apparatus brought out which was very good; but, of course, it was a question of expense, and he did not know of any very cheap and easy method. After all, it did not serve any particularly useful purpose as to whether the gas was good, bad, or indifferent. But there was one connection in which it was of value. If it was decided to change the supply from coal gas to water gas, this would alter the specific gravity, and it would therefore, in order to keep up the supply, be necessary to have a greater initial pressure at the works. Otherwise, as he had already remarked, there would be a falling off of consumption, and the manager would be asked for an explanation.

SCOTTISH JUNIOR GAS ASSOCIATION.

Visit of the Western District to the Provan Gas-Works.

The members of the Scottish Junior Gas Association—Western District—to the number of about 140, paid a visit on Saturday to the new Provan Gas-Works of the Glasgow Corporation. The place of assembly was the gate of the works, where they were met by Mr. James Lowe, the President, who, as each group came up, provided them with a guide, and sent them off on an itinerary of the premises. The route lay by the experimental station, which is not yet in working order, past the two large gasholders, one of which is still in the hands of the Contractors, then to the water-pumping station, the water-cistern on the top of the hill, the lime-kilns, the railway yard, the coal-store, the retort-house, the condensers, the coke-yard, the oil-gas plant, the purifier-house, the scrubbing plant, the exhauster-house, and the station-meter house. Most of the time was spent in the coal-store and retort-house (where the coal tipping, breaking, and conveying arrangements came in for a great deal of attention), and the charging and drawing machines were seen at work. The outside producers were also closely inspected; and considerable interest was taken in the method of withdrawing the coke by means of small locomotives, and the quenching of it in structures specially erected for the purpose. The works were found to be but little altered since their formal opening, in September last; almost the only visible change being that the grounds have been got somewhat more into shape. The oil-gas plant is still unfinished; and it may be that before another winter the illuminating power of the gas will be so far reduced that it will not be much required. In the condensing department, it has not as yet been found to be necessary to bring into use the water-condensing batteries; the extensive series of atmospheric condensers being sufficient to deal with the bulk of the gas made.

At the conclusion of the inspection, tea was served in the workmen's dining-room—Mr. Alex. Wilson, the Gas Engineer of the Corporation, being in the chair. The inspection of the works occupied two hours, and arrangements had been made for the spending of other two hours, after tea, in a social manner, the form of which was that of a smoking concert. Before beginning this, however,

The President said they had almost got through their first session as the Scottish Junior Gas Association. There was only one more meeting, and he thought that, without any vanity, as an Association they could say that they had done fairly well. What they had accomplished was, of course, only an earnest of greater things in years to come. A great deal of the work of the Association had been done by the Council; and they were indebted to the Secretary for a great deal of their success. He wished them to give the Council and Mr. Mason, the Secretary, a very hearty vote of thanks. He hoped they had all enjoyed their visit to Provan.

Mr. A. Wilson said it was with great pleasure that he was there that night. They were all certainly most welcome to Provan. He mentioned the matter at the Gas Committee meeting the other day, and they acceded with great pleasure to the entertainment. He yielded to no one in the interest he took in the Scottish Junior Gas Association. He saw great possibilities for it; and he should do everything he could to forward the interests of the Association. He was very glad to hear Mr. Lowe speak as he did of the Council and Secretary; and they, as well as the President, deserved a vote of thanks. There had been nothing left undone that could be done to make the Association a success. The times were trying. Electricity ran them very hard, especially in Glasgow. It was a sort of "favourite bairn." It had had a lot of coddling. He did not say it needed coddling now; but it had had it, and it would take a considerable time to get people to look at the subject on its real merits. Those who were in charge of electricity had pushed their business hard; and they who were in charge of gas would require to do the same. Most of them were pushing now; and he was glad to say they had recovered some of the ground that was taken from them. As the merits of gas lighting and of gas for power became better known, he had not the slightest doubt but that they would more than hold their own.

Mr. J. Bell (Airdrie) proposed a hearty vote of thanks to the Glasgow Gas Committee, and to Mr. Wilson, for the splendid way in which they had been entertained; and also to Mr. Webster and the officials at Provan for the manner in which they had explained the various apparatus in the works.

Mr. Wilson, in acknowledgment, said he would have great pleasure in conveying the vote of thanks to the Gas Committee; and he might say that if any of them would like to see more of the Provan works, they would be very glad to show them at any time which might be arranged.

The smoking concert, which turned out to be an excellent entertainment, was then proceeded with.

THE ACETYLENE ASSOCIATION.

Fourth Annual Meeting.

The Fourth Annual Meeting of the Acetylene Association was held last Thursday at the Westminster Palace Hotel, under the presidency of Sir Charles S. Forbes, Bart., who, as usual, gave the members a short account of what has been accomplished during the past year.

Official Recognition of the Association.

The first gratifying fact that the President had to call attention to was that the Association had received official recognition from various Government Departments. The Local Government Board frequently referred to the Association for information, and recognized them as the authority on generators. There was a certain amount of responsibility attaching to this; and he was rather anxious at one time that the Association should not be the sole authority, as they were not a Government Department, and so could not enforce their regulations. But the Government could enforce them; and if they said that the Association's regulations were to be the regulations, it meant that they became practically law. There was some difficulty a year or so ago with one firm who absolutely refused to fall in with the Association's views. They would not allow their machines to be tested, and would not apply for special exemption. Of course, it was not their business as an Association to go and ferret out information and forbid certain makes of machines. They laid down their rules; and if anybody wanted to know whether they had the right thing or not, they could protect themselves by studying them. The rules were for other people to make use of.

Bye-Laws Governing the Importation of Carbide.

The second matter upon which they might congratulate themselves was the modification of the bye-laws governing the importation of carbide of calcium. As the members were aware, the Board of Trade had formulated a sort of model set of bye-laws for the use of harbour authorities. Among these, there was the limit of 140 lbs. as the weight of a package of carbide; and seeing that a large amount came from abroad in 2 cwt. lots, this stipulation was very awkward. The regulations as now framed, however, allowed these larger packages to be brought into the country. An indirect outcome of this, was the intimation of the Secretary of State for the Home Department to local authorities that there was no need on their part to place any limitation on the size of packages for the conveyance or storage of carbide of calcium, and, further, that it was seldom necessary to require that each containing vessel should be fitted with a lock.

Storing Carbide without a Licence.

Next, the quantity of carbide allowed to be stored without a licence had been raised. Now 5 lbs. of carbide could be stored absolutely without any conditions at all, and 28 lbs. without a licence if a few stipulations were complied with. One of these conditions was that where a fixed generator was used on the premises, there should be exhibited near the generator a certificate, signed by the maker or supplier, that it complied with the regulations as to acetylene generators issued by the Association.

Railway Regulations.

There had also been a modification in the railway regulations affecting the packing of carbide for transit. He was quite aware that some of the members did not think the Association had done so much as they could have; but it was impossible to force the railway companies. All they could do was to suggest. Greater

facilities had been granted for the transit of carbide by the railways South of the Thames; and he hoped that the new Council would be able again to approach the companies this year, and get the regulations still further relaxed.

Testing Generators and Purifiers.

As regarded the testing of generators and purifiers, the Association were very fortunate in obtaining the services of Mr. J. W. Gatehouse, of Bath. In every case in which tests had been carried out by him, the work had been done satisfactorily; and he thought that Mr. Gatehouse supplied the want of a technical expert very well indeed.

The Death of Mr. F. G. Worth.

Though the Association had lost no honorary members during the year, they had suffered one very serious loss in another direction by the death of their late President, Mr. F. G. Worth. They would remember that Mr. Worth practically started the Association; he might also assert that he started the industry in this country. He thought it was not too much to say that they were very lucky in the fact that Mr. Worth was spared long enough to bring the Association into the position it now occupied. Without his co-operation, the Association would probably not have reached its present position.

Certification of Acetylene Gas-Fitters.

The certification of acetylene gas-fitters was a very good idea in theory, and some day ought to be carried out; but at present it would be very difficult. There would be an enormous amount of jealousy aroused among workmen if one had a certificate and another, perhaps equally capable, had not. If it was done at all, as he thought it ought to be, it should be carried out thoroughly; and it would be necessary to ascertain absolutely the capabilities of men before giving a certificate. The matter was one that required serious consideration.

The Proposed Acetylene Exhibition.

As to the proposed Acetylene Exhibition, the President said there were certain difficulties in the way. The first was one more or less of finance; and the second was in finding the right place in which to hold it. It was suggested that it should be held at the Royal Agricultural Society's Show; but there was some doubt as to the continuance of these, and so no move had been made in the matter. They did, however, approach the authorities of the Gas Exhibition at Earl's Court; but there they were met with a different kind of difficulty, as the people running that show refused to have them. Some of the members seemed still to be hankering after an exhibition, and personally he should much like to exhibit; but it was quite another thing organizing a show. If anyone had any suggestions to make as to how the business could be carried out, he had no doubt it would be popular; but he had no proposal to lay before them.

Mr. T. Shore said he thought that the idea of co-operating with the Royal Agricultural Society should be again taken into consideration. The Society had raised their guarantee, so there was no doubt there would be another show. The place would be a suitable one, and the people attending—from remote districts and abroad—would be those to whom the industry wished to appeal. It therefore seemed a chance worth a very vigorous effort to take advantage of.

The President remarked that in his opinion this was the only suggestion at present feasible to follow up; but it was thought that the time of year—June—was a very bad one for an exhibition of artificial light. It should be held in the winter.

Mr. Shore said he would move that the Executive be urged to take into immediate consideration the question of holding an Acetylene Exhibition at Park Royal, if possible at the next Agricultural Society's Show in June. There was practically nowhere else in London; and though it was quite true that the exhibition should be held in winter, they must bear in mind that there was very little chance of an acetylene show pure and simple attracting people from far-away places to see what they had to exhibit.

Mr. C. Hoddle moved, as an amendment, that an effort should be made to find some place more suitable than Park Royal, and suggesting Earl's Court at the same period of the year that the recent Gas Exhibition was held.

On a vote being taken, the amendment was carried.

General Business.

The report and accounts having been adopted, it was agreed that something should be done to improve the financial condition of the Association. To this end, a resolution, proposed by the President, was carried—"That the meeting thinks it advisable to increase the subscription to two guineas per annum; and that the Secretary be instructed to report this to the members, and take their vote on the subject." Some slight alterations in the Articles of Association were announced; and four new members of Council were elected—Messrs. Beaumont, Ross, Baker, and Lea.

The proceedings concluded with a vote of thanks to the President. The Honorary Solicitors (Messrs. Batten, Proffitt, and Scott) and the Honorary Auditors (Messrs. Fitzpatrick, Graham, and Co.) were also thanked for their services, and re-elected.

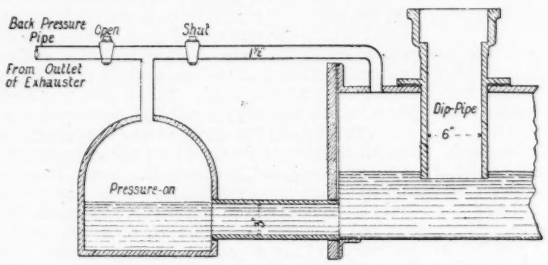
CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Hydraulic Mains.

Sir,—Anent the recent controversy, *re* improvements in hydraulic mains, it has occurred to me that, in fairness to other experimentalists of past years, the following information was due, and would be interesting to gas engineers and patentees.

I enclose a tracing of an original drawing belonging to my father, Mr. J. H. Parsons, of Oswestry, showing that the method of employing pressure from mains beyond the exhauster was used by him for the



purpose of sealing and unsealing the dip-pipes in hydraulic mains no less than 27 years ago. This, I take it, is the essential principle, apart from trimmings, which Mr. George Helps's claims.

Gas-Works, Rowley Regis, Feb. 18, 1905. Frank Parsons.

The Lady Lecturer and Teacher.

Sir,—I have followed this correspondence in the "Journal" with great interest.

One very important consideration seems to have been omitted—namely, that each town or centre must be managed according to the population living within the radius, whether it be purely residential or artisan, or fairly divided between the two. In exactly the same way, lectures at gas exhibitions should not be of the same kind and style of lecture in every town and in every part of the country. It is most necessary that a lecturer or teacher should be able to understand and recognize the requirements of her audience, and of that particular part of the country in which she happens to be working.

In passing, there is a statement in a letter that, personally, I must most emphatically contradict—"that the hints given on the management of gas-stoves were seldom heeded," &c. I have always found the reverse to be the case; and, both from audiences and directors, I have received assurances of it. I have no hesitation in saying that enormous good has been done in this way.

As to the future, it will obviously be of immense benefit to gas companies and consumers that the services of a lady should be retained. But her duties, like those of the lecturer, must be regulated according to the district in which she is employed; and the fullest benefit can only be obtained by the generous and loyal work of the directors. As I have pointed out, it would be impossible to determine her work, as for a time it must be purely in the nature of an experiment. But I think a building should be provided—preferably a house with a showroom on the ground-floor, in a convenient locality (not necessarily on the main street, but certainly near it), where public and private lessons and demonstrations can be given. Details would vary in every town, and could be arranged as required.

If it should meet with your approval, I will at once offer my services to any gas company for three or six months or a year, at (say) a salary of £200. This is, of course, purely an experimental offer; and it would be for the company at the end of the time to decide whether the saving to them in time and expense for repair of stoves, and the increase in the use of gas for cooking and heating, warrants their increasing the salary or discontinuing the experiment.

Rose Brown.

Manor House, Chesterton, Cambridge, Feb. 20, 1905.

Storm-Proof Lanterns for Incandescent Street Lighting.

Sir,—The information supplied by Mr. Kendrick respecting his experience with incandescent street lighting, published in your last issue (p. 482), furnished an additional useful record upon this important subject. The value of storm-proof lanterns is apparent; and the figures referred to are sufficient evidence, if any were needed, upon the point. With wind-proof lanterns, an average of less than three mantles per lamp per annum is excellent; and it is noticeable that these results have been accomplished with an anti-vibrator coupled with a storm-proof lantern.

My object in writing is to call attention to the number of defective and miserably designed lanterns now on the market. Many are called "storm-proof;" but as they are not constructed upon any proper basis respecting the inlet and outlet for air, the term is incorrect. Generally the outlets provided are much larger than the inlets, so that an erratic draught is set up. It is a common thing to see lamps in some districts where the gas is always fluctuating through this defect. In the case of incandescent lighting, the primary air to the lantern should not exceed the diameter of the glass chimney, as this is theoretically all the air required. These chimneys are about $1\frac{5}{8}$ inches diameter, or 2·76 square inches area; so that apertures for the air supply should be

provided at the bottom of the lamp to this extent only. If two, three, or four burners are required, then a proportionate area must necessarily be provided for. Frequently one sees a lantern with an internal metal cylinder at the top about 5 inches diameter, or nearly 20 square inches area; while at the same time the inlet spaces at the bottom are less than a quarter of this. But assuming that the area at the top and bottom is provided for at 20 square inches, it is evident how excessive is such a size. It is not to be wondered at that the light fluctuates and is often discredited altogether. I have known this deplorable result in street lighting to obtain where the authorities concerned, having been puzzled, have reverted to flat-flame burners. The fact is, every tinsmith and coppersmith considers he can make a street-lantern; whereas it will be admitted that their design is of far greater importance to-day than it was formerly, when flat-flame burners solely were in use.

Huddersfield, Feb. 23, 1905. EDWARD A. HARMAN.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bill presented and read the first time: Shepton Mallet Gas Company (Electric Lighting) Bill.

Bills read a second time and committed: *Abertillery Urban District Water Bill, *Bangor (County Down) Water and Improvement Bill, *Blackpool Improvement Bill, Hessle Gas Bill, *Hythe Corporation Bill, Mansfield Corporation Bill, *Matlock Bath Improvement Bill, *Nottingham Corporation Bill, *Southport, Birkdale, and West Lancashire Water Board Bill, Tees Valley Water Board Bill, *Torpoint Urban District Water Bill, Tralee Urban District Council Bill, *Whitby Urban District Council Bill.

Petitions have been presented against the Bills marked with an asterisk (*), as well as against the Llandrindod Wells Urban District Council Bill, the Shepton Mallet Gas Company (Electric Lighting) Bill, and the Truro Water Bill.

The Leeds Corporation (Consolidation) Bill, suspended last session, has been brought from the Commons, read the first and a second time, and committed.

In connection with the Southport, Birkdale, and West Lancashire Water Board Bill, opposition has been withdrawn on behalf of Lord Derby. Financial clauses have been agreed to which will be favourable to both Southport and Birkdale. The petitions that have been lodged against the Bill are from the West Lancashire Rural District Council, the Skelmersdale Urban District Council, the Ormskirk Gas Company, and the St. Helens Corporation.

HOUSE OF COMMONS.

The following Bills have been presented and read the first time: Accrington District Gas and Water Board Bill, Andover Lighting and Power Bill, Aylesbury Gas Bill, Bolton Corporation Bill, Bootle Corporation Bill, Brentwood Gas Bill, Brompton, Chatham, Gillingham, and Rochester Water Bill, Colne Corporation Bill, Croydon Corporation Bill, Croydon Gas Bill, Epping Gas Bill, Gaslight and Coke, South Metropolitan, and Commercial Gas Companies Bill, Great Berkhampstead Gas Bill, Halifax Corporation Bill, Higham and Hundred of Hoo Water Bill, Hitchin and District Gas Bill, London County Council (General Powers) Bill, London Gas Bill, Loughborough Corporation Bill, Morley Corporation Bill, North Sussex Gas Bill, Otley Gas and Improvement Bill, Rhondda Urban District Council Bill, Seaham Gas Bill, Skegness Water Bill, South Metropolitan Gas Bill, South Oxfordshire Water and Gas Bill, South Suburban Gas Bill, Stockport Corporation Bill, Sunderland and South Shields Water Bill, Swansea Corporation Bill, Thames Conservancy Bill, Walker and Wallsend Union Gas Bill, Wrexham Gas Bill.

The Leeds Corporation (Consolidation) Bill, suspended from last session, when it reached the report stage, was read the third time and passed.

On Tuesday, on the motion of Mr. Gibson Bowles, a return was ordered showing the total amount of the outstanding balances of the loans of local authorities in England and Wales, Scotland, and Ireland, at the close of the financial years 1873-4, 1883-4, 1893-4, and 1903-4, with the totals for the three countries on those dates.

On Wednesday, on the motion of Sir Charles Dilke, a return was ordered showing: (1) For England and Wales, as regards each County Council, Town Council, Metropolitan Borough Council, Urban and Rural District Council, and Board of Guardians; (2) for Scotland, as regards each County Council, Town Council, Parish Council, and District Committee; and (3) for Ireland, as regards each County Council, Town Council, Urban District Council (not being a Town Council), Rural District Council, and Board of Guardians; whether the contracts entered into by the authority for the execution of works specify any conditions as to the wages to be paid by the contractor, or other conditions with regard to the persons employed by him; and, if so, what are the conditions so specified.

On Thursday, a Bill to amend the law relating to Private Bill Procedure in Ireland was presented by Mr. O'Doherty (North Donegal), and ordered for second reading.

At a recent meeting of the Ossett Town Council, the salary of the Gas Engineer and Manager (Mr. A. E. Mottram) was increased by £50 per annum.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Feb. 20.

(*Before Mr. Justice* DARLING.)

Ocean Accident and Guarantee Corporation v. Ilford Gas Company.

In this action, which was tried recently (*ante*, p. 366), the Jury disagreed; but one of the points taken by the defendants was not referred to at all in the course of the trial, it being considered a question entirely for the Court—namely, whether the plaintiff Company had any right of action against the defendants in respect of the matter complained of. This question came before the Court for decision to-day.

Mr. SHEARMAN, K.C., and Mr. LECK appeared for the plaintiffs; Mr. LAWSON WALTON, K.C., Mr. DUKE, K.C., and Mr. SYLVAIN MAYER represented the defendants.

Mr. LECK said the action was brought to recover damages for injury done to certain leasehold premises situate at Ilford; the plaintiffs being first and second mortgagees. The position of the title was this: On Dec. 19, 1899, there was a lease for 99 years from one Lawrence to two persons; and on the same date there was a statutory mortgage from these persons to Lawrence. On May 6, 1902, there was a statutory transfer of the above mortgage from Lawrence to the plaintiff Company; and on Aug. 27 of the same year there were two mortgages to the plaintiffs dated the following day. After this, the plaintiffs took possession of the property, which was let on a weekly tenancy. The injury done by the flood was of a serious and permanent character; and under the circumstances named, he submitted that the plaintiffs had a good cause of action.

Justice DARLING said that was not the point. The question was whether they had a good title to maintain the action.

Mr. DUKE submitted that, upon the admitted facts, the plaintiffs had no legal interest at all in the premises. If the damage was only transient, it belonged to the persons who were entitled to the possession of the premises; but if there was damage to the reversion, then it was to be divided between the people who were interested in the reversion, in proportion to the legal estate which they held. If the plaintiffs had no legal estate, they were not entitled to maintain the action. The plaintiffs were merely tenants at will of the mortgagees; and their tenancy was subsequent to the injury now sued upon. He contended that they had no legal estate which entitled them to sue.

Justice DARLING asked whether the plaintiffs had the legal estate in the property.

Mr. LECK replied that it was enough to maintain an action for trespass if they were owners in possession.

Mr. DUKE said there was no possession in the Ocean Accident Company, and no right to possession, as they had not the legal estate. The occupants were the tenants at will of the legal mortgagee; and possession was acquired by the plaintiffs subsequent to the occurrence of the alleged injury. This being so, they had no right of action.

Mr. LECK then cited several authorities with a view to showing that the plaintiffs were proper persons to sue, and had a right to maintain an action in respect of injury to the reversion.

Justice DARLING, in giving judgment, said, with regard to the plaintiff Company, he was of opinion that at the time they commenced their action they had not a title which gave them any right to bring it. It had been urged that the plaintiffs were entitled to sue in respect of injury done to the reversion; but, so far as he could see, no injury at all had accrued to the reversion. The water was for a few hours in the cottages; but it soon subsided, and the buildings did not tumble down. It was said that they were dirty; but, if so, they could be whitewashed and the floors cleaned. It would be allowing a technical point to give a right of action, for when it came to be tried it would be found that no damage had been done to the reversion. He declined to allow an amendment of the pleadings. It had been said that in a previous case the Jury had found in favour of the plaintiffs. In the present instance, unfortunately the Jury disagreed. After hearing the evidence, he (the Judge) came to the conclusion that the flood clearly was proved to have arisen through the blocking of an arch of Ilford Bridge with a lot of wreckage which floated down the stream from houses in course of erection on the railway land; and the Jury would no doubt have arrived at this decision but for the prejudice which had been introduced by mentioning the fact that another Jury in another action had found a verdict against the same defendants in respect of something which happened in consequence of the flood. This was just the kind of topic with which to mislead a Jury; and it was not one which could assist them in any possible way. For these reasons, he declined to allow an amendment. There was no claim for damage done to the reversion. He would have allowed an amendment, if he thought there were merits on the side of the plaintiffs; but he had come to the conclusion that there were not. Under these circumstances, judgment would be entered for the defendants, with costs as against the Ocean Accident and Guarantee Corporation. With regard to the other plaintiffs, they were still upon the record; and they might set the case down and try it again.

Leave to appeal was given.

The Coventry Corporation Gas Committee have been considering a report by the Engineer and Manager (Mr. Fletcher W. Stevenson) with respect to the system of purification to be adopted at their new gas-works at Foleshill—a matter which it is necessary should be decided before the designs for the purifiers are got out. Lime purification is in use at the old works; but Mr. Stevenson recommends oxide of iron for the new ones. All the advantages which the proposed system possesses over the present one are clearly set forth by the Committee, who are further guided in their report by the views of Sir George Livesey, whom they have consulted.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday, under the presidency of Mr. H. WADE DEACON.

The CHAIRMAN, in moving the adoption of the report, said that for the past 23 years the position he now took had been occupied by Sir Edward Lawrence. He was sure they had grown so used to seeing him in the chair and listening to his interesting speeches, that it must be somewhat of a shock to find someone else presiding that day. They would congratulate themselves on the fact that, though he had retired from the chairmanship, Sir Edward still remained a Director of the Company. At this meeting there were no accounts to present to the shareholders, so there was little to talk about. He could, however, say that a statement which the Directors had had prepared for them, showing the working of the Company for the half year, indicated that affairs were progressing in a satisfactory manner. The amount of gas supplied to consumers was slightly increased over the corresponding half of the previous year, in which period there was also an increase. The number of automatic meters had also considerably increased; and the policy of the Company in supplying stoves to consumers having these meters had likewise been successful. The only unfortunate part of the half-year's working had been the residual products—coke, tar, and ammonia. The revenue from this source had been considerably less than in the corresponding half of last year; but this decrease was foreseen in the estimates. They had good reason for expecting better results from the sale of ammonia for the rest of the year. The Directors were also fully alive to the necessity of making gas as cheaply as possible, and they were introducing improvements which would tend, they believed, to economy in production. These things cost money; but in face of the competition of electric light, the Directors felt it was a wise policy to obtain every possible improvement for economical working. There was another matter to refer to. Some years ago, the Directors took into consideration the question of the formation of a superannuation fund for the mutual benefit of the Company and of their staff, and also indirectly for the consumers of gas. The scheme was adopted in 1899; and under the conditions then agreed upon, the funds had since been carried on. Broadly speaking, the principle was that the fund was supported by contributions from the Company and from the staff; the Company paying 5 per cent. and the staff 2½ per cent. on their salaries. The management of the fund was entirely in the hands of the Directors. As five years had elapsed since the formation of the fund, the Board thought the present was an opportune time for an actuarial examination. For this purpose, they secured the services of Mr. Duncan Fraser, of the Royal Insurance Company; and it was quite clear from his report that the inauguration of the fund had rejuvenated the service of the Company and had increased its efficiency, and it had also been economic from the Company's point of view. It was, however, evident that the contributions to the fund on the present basis were not sufficient to maintain it permanently in a solvent condition. It was so manifestly to the interest of all concerned that the fund should be at all times in a condition to meet liabilities, that the Directors had taken steps to secure it being placed on a solid basis; and with this object, they had decided to increase the contribution of the Company from 5 to 7½ per cent. In future, a statement of the fund would be given along with the ordinary accounts of the Company.

The report was adopted; and dividends were afterwards declared for the half year of 5 per cent. on the ordinary consolidated stock, and 3½ per cent. on the consolidated 7 per cent. stock.

The proceedings terminated with a vote of thanks to the Chairman.

CROYDON GAS COMPANY.

The Chairman on the Gas Exhibition and the Connection with it of the Company's Engineer and General Manager.

The Half-Yearly General Meeting of this Company was held last Friday, at the Croydon Art Gallery, Park Lane, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) having read the notice convening the meeting, the report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the healthy expansion of the Company's business to which he had now for several successive half years had the pleasure of referring, had shown no sign of falling off in the period under review. In some respects, indeed, the statement was, he thought the proprietors would agree, more satisfactory than those that had preceded it. The rate of increase in the quantity of gas sold of 7·32 per cent., though not quite so high as in several recent half years, was still a good one; while the increase in the number of consumers—viz., 1264—and in the number of stoves on hire, 1033 (a greater increase than in any previous half year) promised well for the future of their undertaking. He need hardly point out that the half year in which a new consumer was added, and during a portion only of which he was using gas, was not the half year in which the full benefit of his account was felt. The proprietors would have seen in the report a reference to the International Gas Exhibition held in November and December last, and doubtless many present visited it. Those who did so would, he thought, agree with him that the exceedingly fine display there made of the many uses to which gas could be put must have opened the eyes of visitors to the fact that while gas was far indeed from losing ground in the race as regards lighting purposes, and could offer nowadays many of the advantages of convenience and decorative effect once claimed as the exclusive property of electric light, this use for lighting was but one of the very many ways in which it served the public convenience. Perhaps the best test for finding out whether or not the exhibition had, from the point of view of gas companies, justified the time and money spent upon it, were the opinions of the exhibitors on the one hand, and of the consumers on the other. The opinion of the former—especially of those who showed manufactures intended for domestic and trade use—was unanimously that the results of the exhibition had far exceeded their expectations. The makers of gas-stoves, who might be taken as fairly representing this class of exhibitors, had stated that their exhibits brought them a very large number of inquiries and orders from the public—not only in the district in which the exhibition was held, but from all parts of the country; and as the goods they thus supplied came into use, the various gas companies and corporations in the buyers' districts would reap the benefit. Most of the proprietors were probably aware of the special bond of interest that existed between the Company and the exhibition in that their Engineer and General Manager (Mr. James W. Helps) was elected Chairman of the Advisory Committee appointed by the Institution of Gas Engineers to generally supervise the exhibition arrangements, and to organize the exhibition in its educative, as distinct from its trade, aspect. In his capacity of Chairman, Mr. Helps found full scope to display the energy and thoroughness in his work which the Directors had long regarded as his characteristic; and it was very gratifying to them to know that, so fully did the exhibitors appreciate his contribution towards the success, that they had within the last few days joined in presenting him with a very handsome memento as a mark of their appreciation of the results he had achieved. Now as to the view taken by those of the general public who visited the exhibition. These were, after all, the people from whose visits gas undertakings must chiefly look to give them the benefit of increased sales. As the proprietors had doubtless read in the report, the Directors sent to every gas consumer in the Company's district an invitation to visit the exhibition, with two free admission tickets annexed. A similar course was, he believed, taken by many other gas undertakings. The Croydon Company sent out in all some 45,000 tickets; and of these 2302 were used. The Chairman here read a letter received from a resident in Croydon who used one of the tickets of admission, which resulted in his going in for an installation of gas for heating his workshop. Passing to other matters, the Chairman said the Directors found it necessary to raise further capital during the half year; and this they did by the issue of debenture stock, because in this way the money could be raised at the cheapest rate. On Nov. 1, £2500 of 5 per cent. stock was issued to bring the total amount of stock of this denomination to £40,000, and at the same time £5000 of 4 per cent. stock was sold. The advantage of issuing stock bearing the lower rate of interest was that it was issued at a price nearer par; the experience of those concerned in issuing gas companies capital being that, when a stock was not "loaded" as it was termed, investors were usually willing to pay a higher price for it relatively to the interest paid. Thus the issue of this 4 per cent. stock was a more economical way for the Company to raise money. He might mention that a further £10,000 was sold on the 1st of this month; and at a higher price than that obtained in November. The most important matter the proprietors would have before them that day was the step the Directors had taken with regard to an amalgamation with the Caterham and District Gas Company. But the Bill promoted to effect this end being the subject of a special meeting which was to follow this, he would reserve what he had to say upon the subject till that meeting. Turning to the accounts, it would be seen that there had been a considerable expenditure of capital on plant and mains. The mains now extended to 176 miles; and the expenditure under this head was partly due to the regular growth of their network of pipes, as fresh streets came to be supplied. But it included also a considerable expenditure in laying larger trunk mains to carry gas to meet the increasing requirements of their districts. Of course, only the increased capital value of these larger mains was represented here; revenue having been fully charged with the portion of the expenditure due to replacements. The proprietors, he was sure, would agree with him that the continued need for expenditure on mains was a matter to be regarded not with regret, but with satisfaction. The expenditure on plant was chiefly due to the erection of a new retort-house in continuation of the No. 3 retort-house. The erection and fitting of this was now rapidly going forward; and the Engineer expected that next winter the new house would be in full work. They would then have one fine retort-house, 400 feet long, in which the charging and discharging of the retorts would be done by compressed-air machinery. They would also reap the benefit they looked forward to when, in 1901, they put down machines capable of working the whole length of the retort-house, as the full utilization of this machinery would then commence. One of the next matters which would have to engage their attention in connection with the works would be the modernization of the older retort-houses (Nos. 1 and 2) at the northern end. These were at present of the older type, and had direct-fired settings. The installation here of regenerative settings would enable considerable economies in fuel consumption to be effected. The Engineer was now actively engaged in investigating the relative merits of the several methods of charging and discharging retorts that had recently been introduced, with the view of advising the Board as to the kind to be installed. During the winter now ending, it had been necessary to use these old retort-houses to a considerable extent; and, good as the general carbonizing results obtained had been, the Directors thought they might look forward to yet better results when all the carbonization was carried out by more modern and improved methods. It would be remarked that £2000 had been carried to the renewal fund, which now stood at £3000. The express object of Parliament in sanctioning the formation of this fund, and of the Directors in creating it, was that it might be drawn upon for the purpose of meeting the charges which come on revenue when extensive alterations to, or renewals of, existing plant had to be made. But for this fund, the expense would become a charge upon the working of the half year in which the alterations or renewals were made, with a consequent tendency to unduly reduce the profit of the half year. He laid stress on these special objects for which this fund existed, because while they hoped in the next few half years to augment the fund, the expenditure which would be incurred upon the alterations he had just alluded to would doubtless deplete it again. Some of the proprietors would recollect that a year ago he explained the reasons which

led the Directors to decide in favour of the "prepayment" or "stop" system of gas supply to small houses, as against the "penny-in-the-slot" system previously in use in the Carshalton district. During the half year which ended in June last, the substitution of all these meters was effected; and the half year they had under review was the first in which a comparison of results of the two systems in the same district could be made. It might be of interest, therefore, if he stated that the average consumption per consumer had been found, as was anticipated, greater under the "stop" system—the increase having been some 8 per cent. They had also found that, although there were now in the premises of the prepayment consumers in the Carshalton district about 25 per cent. less cookers than there were a year ago, yet the aggregate amounts received by the Company for the use of meters, stoves, and fittings was considerably more than then. That was to say, the people who formerly did not really want a cooking-stove, and only had it fixed because, using little or no gas through it, its installation cost them nothing, had returned their cookers. At the same time, the cookers were now being used by other consumers; and the return the Company were getting for their invested capital was better than before. It would not be a matter of surprise to the proprietors when he stated that the Directors had found it absolutely necessary to extend the office and show-room accommodation. The land in Katharine Street was acquired, and the present buildings erected, 25 years ago. The annual sale of gas then was 206 million cubic feet; in the year just ended, it had been 956 millions—nearly a fivefold increase. The Directors had, therefore, decided to erect at Waddon a complete set of shops for stove repairing, meter testing, &c., and to build on the land at Katharine Street enlarged offices, including a show-room. The details of revenue and expenditure would call for but little remark from him. The only unsatisfactory feature was the comparatively low return obtained from coke. This was disappointing, of course; but they could not hope to be exempt from the effect of market fluctuations in the values of their bye-products. So far as he could ascertain, the prices realized for coke continued to compare favourably with those obtained by other companies. He regretted to say, however, that the low price of coke still prevailed, and would affect the current half year, as it did the last. The net result of the half-year's operations was that, after making all proper charges against revenue—charging to the half year £682 for stamp duty on the increased capital under the Act of last year, carrying £2000 to the renewal fund, and writing down the old Carshalton works by a further £1000—they could pay the dividends the Directors recommended them to declare, and carry forward £5573, or £554 more than they commenced the half year with. There was only one other observation. It would be seen that the dividend recommended on the "C" stock was at the rate of 10¾ per cent., or ¾ per cent. more than in August last. This was a result of the operation of the sliding-scale as applied to the price of gas in the Carshalton district. A further reduction of 3d. per 1000 cubic feet was to be made in that district not later than July, 1907; and when this reduction had been made, the "C" stock would be as to dividend on the same footing as the "B" stock.

The Deputy-Chairman (Mr. T. Rigby), in seconding the motion, pointed out that on the item of repairs and maintenance, there had been a saving of £2000; and it might look as if that was bad policy on their part. But as a matter of fact, the Engineer reported that the plant could not be in better condition. In the latter part of the half year, they had very dark and cold weather; and there were exceptional demands upon the manufacturing plant. But he might say that these demands were met without a hitch. Some of this was no doubt due to the excellent work done by the staff and workmen. But it also showed that sufficient money had been spent on the plant, and that it had been kept up to date.

Mr. Thomas Wright congratulated the Directors upon the state of the Company's affairs—specifically mentioning several points that had particularly and favourably appealed to him. The only matter which was not so pleasant to contemplate was the extraordinary expenditure upon rates and taxes; but this the Directors could not help.

The Chairman said, as to the rating question, they had a strong fight over it, which they rather feared at one time would not end amicably. But he was pleased to say it did by a little give and take; and they arrived at a settlement without going to further expense.

Mr. Corbet Woodall moved the declaration of dividends at the rate of 14½ per cent. per annum on the £51,600 consolidated "A" ordinary stock, 11½ per cent. on the £178,000 "B" ordinary stock, and 10¾ per cent. on the £80,000 of "C" stock. He said he should not keep the proprietors very long in proposing this resolution. The balance-sheet showed that in making it they were entirely justified by the profits of the half year. He would give one or two figures to show that, although they were spending large sums upon capital account because of the extension of the business, it had been spent, under the direction of their Engineer, wisely. The capital expenditure per 1000 cubic feet sold had fallen during the last three years from 10s. 6d. to 10s. 3d.; and, better still, the cost of paying interest and dividend upon that capital had also fallen from 10·3d. in 1902 to 9·6d. in 1904. As doubtless all the proprietors knew, the business which the Company did now was largely with small consumers, and this involved an expenditure exceptionally great, because they provided not simply the service-pipe and meters as in the old days, but stoves, meters, pipes, and burners. To find then that they could do this, and at the same time reduce the charge for the payment of the dividend and interest, was a satisfactory feature. The diagram which was exhibited in the room showed the rate at which the consumption of gas had increased during a long term of years. The highest rates of increase had been in the last ten or twelve years; and these were the years during which they had had to face the competition of electricity. This competition had been a serious one. It had taken from the Company a considerable amount of business; but it had had compensating advantages. It had spurred the Company to do its best for the consumers, and the result had been that their business had grown, nothwithstanding the loss they had sustained, at a much greater ratio than before the period of competition. With regard to the question of the rates, the Company did not grudge the payment of their contribution to the rates and taxes. They were trading in Croydon, and their profit depended partly on the repute of the town as one well kept and maintained; and it would be unworthy of the Company if they said a word in complaint when required to pay their fair proportion of the necessary rates. The only reason they entered into dispute on this matter was that they felt there had been a mistake—with regard to the proportion they were asked to pay. There were always differences of view as to the basis upon which rates should be calculated; and it was a gratification to the Board to know they were able to satisfy the rating authorities and to come to a satisfactory and amicable settlement.

Mr. W. Cash seconded the motion. He remarked that, although it sounded a large dividend at the rate per cent., it was not the maximum dividend to which the proprietors might be entitled under the provisions of the Act and the sliding-scale; and in regard to the great proportion of the capital, it should be remembered that the shareholders had paid a heavy premium for it, and upon that premium there was no dividend.

The retiring Directors (Mr. T. Rigby and Mr. Corbet Woodall) and the Auditor (Mr. John Jones) were unanimously re-appointed.

A hearty vote of thanks was passed to the Chairman and Directors; and acknowledgment was made by the Chairman. Proceeding, he moved a similar vote to the Engineer and General Manager (Mr. Helps), the Secretary (Mr. W. W. Topley), the Assistant-Engineer (Mr. A. Caddick), the staff, and the men, of the services of all of whom the Chairman could not have spoken more enthusiastically. This was seconded by Mr. Samuel Spencer; and Mr. A. W. Oke added a few words, remarking upon the value of Mr. Helps's services in connection with the International Gas Exhibition. Not only in Croydon, but in the gas world generally, would, he said, the results of the exhibition be seen in balance-sheets in future years. The kind drift of the remarks concerning himself and his work was acknowledged by Mr. Helps. Speaking of the hearty co-operation of his men and staff during the winter, he incidentally mentioned that there were several of the workmen at the meeting in the proud position of shareholders. One gentleman present for the first time was Mr. Sandeman, the Chief of the Distribution Department. He only came to them seven months ago, and had won golden opinions from the employees and consumers. Mr. Topley also made an appreciative acknowledgment on behalf of himself and staff.

The Proposed Transfer of the Caterham Company's Undertaking.

An Extraordinary Meeting of the Proprietors was then held to consider, and, if thought fit, approve of, the Bill before Parliament, providing for the transfer to the Croydon Company of the undertaking of the Caterham and District Gas Company, to authorize the raising of additional capital, and for other purposes.

The Chairman said the meeting had been convened for the proprietors to consider an agreement which had been entered into with the Caterham and District Gas Company, and the Bill which the two Companies had, in pursuance of that agreement, jointly promoted in Parliament for the amalgamation of the two undertakings, or really for the absorption of the Caterham Company by the Croydon Company. Giving a brief account of the circumstances which had brought about the promotion of the Bill, and of the reasons which had led the Directors to take the action they had done in the matter, he said that about a year ago a tentative proposal for amalgamation was made by the Directors of the Caterham Company; but owing to the ill-health and absence at the time of the Engineer and General Manager, the Directors (though they thought the question worthy of serious consideration), postponed the matter till, in their deliberations, they could have the benefit of Mr. Helps's advice. Later on, after his return, the question was taken up. The very fullest opportunities for investigation having been placed at the disposal of the Croydon Company by the Caterham Directors, that Company's accounts were carefully gone into and tabulated; and the matter was fully considered by the Board from the points of view alike of engineering practicability, probable increase in the number of consumers, and financial prospects. The Directors would like to take this opportunity of acknowledging the entire freedom with which the whole of the records of the Caterham Company had been laid open to the inspection of their officers. Mr. Cash also gave the Directors the great advantage of his special knowledge in directing the investigation into the accounts. These circumstances were of immense assistance to the Board in arriving at what he hoped and thought would prove to be the accurate conclusions they came to. Shortly put, they were these: That, by taking over the Caterham undertaking, and manufacturing the gas at our own works, they could afford to give to the consumers in the Caterham Company's district a very substantial reduction in price—rather over 4d. now, and more later on—and could, in the early future, still have a margin of profit, after paying the dividends on the Caterham shares, to go to the benefit of the whole undertaking. This one fact would show the rapid increase in sales of gas in the Caterham district. In 1896, the sales amounted to 16 million cubic feet; and last year they had grown to 44 million cubic feet—or just on threefold in nine years. The Caterham district was one in which a great deal of building was going on; and there was, the Board believed, a probability of continued increase in the consumption of gas. This increase they hoped to stimulate by the reduction in the price of gas, and the efforts they would make to extend its use for cooking and heating, as well as for lighting. From the point of view of joining up the distribution systems, the two districts could hardly be better situated. The districts adjoined at many points, and most fortunately the works of the Caterham Company were situated very close to the boundary line between the two districts, and on the main road from the Croydon Company's district to that of Caterham. Therefore, all that would be necessary would be for them to carry a main of sufficient size into the works, and to commence distributing gas from the very heart of the Caterham distribution system. When he added that this point was practically at the lowest level of the Caterham Company's district, those who had any acquaintance with the problems of gas distribution would understand how advantageous

the conditions would be for good working. There was an incidental advantage in the amalgamation too, which, though it would not be operative after the lapse of a few years, made it particularly valuable to them now. They were engaged at Waddon on a very considerable extension and remodelling of their manufacturing plant. In a growing undertaking such as theirs, work of this kind must always be carried out with an eye to the future. That was to say, it would not be good policy to spend large sums of money on buildings and plant sufficient only for immediate requirements. To do so would mean repeating the expenditure shortly afterwards, and a considerable waste of money. So the extensions they were engaged on at Waddon would, when completed, put them in possession of manufacturing plant sufficient to produce gas to an extent much beyond their immediate needs. Therefore, when they closed down the Caterham works, they would need to spend on their works at Waddon practically no more money than they otherwise should do; but this expenditure would become remunerative earlier than it would do without this added consumption. These reasons, would, he thought, show that good grounds existed for looking on the amalgamation with a friendly eye. The difficult question of adjustment of interests had, of course, to be gone into with the Caterham Company; but the Directors believed that the settlement arrived at, and fully set out in the Bill, was a thoroughly equitable one; and they did not hesitate to recommend it for adoption.

The SOLICITOR (Mr. C. F. T. Blyth) then gave a summary of the agreement (*ante*, p. 81) with the Caterham Company, and also read the heads of the Bill.

The CHAIRMAN, in moving the necessary resolutions approving of the agreement and of the Bill, remarked that they got their last Bill through as an unopposed measure; and he hoped, as the result of the negotiations which were still pending, he would be able to announce at the next meeting that this Bill had also been unopposed.

Mr. SAMSON seconded the motion.

Mr. C. E. BOTLEY asked what was the amount of the Caterham reserve and undivided balance, because he saw the Croydon Company had to pay certain compensation and costs.

The CHAIRMAN replied about £1000 of undivided balance.

A few other questions leading to further explanation were put; and then the resolutions were unanimously carried.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Bell Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) read the notice convening the meeting, and the Directors' report and the accounts were taken as read. The former stated that the make of gas continued to increase; being for the whole year 5¾ million cubic feet in excess of that of the previous year. The price of gas was reduced from 3s. to 2s. 11d. per 1000 cubic feet, as from and after Michaelmas last. Residuals, owing to the smaller demand and greatly reduced price for coke, had been again less remunerative. Since the previous report, the Directors had issued, on sale by tender, £9000 of the 3½ per cent. perpetual debenture stock, which realized £8162. The profit and loss account showed a balance of £10,121.

The CHAIRMAN, in moving the adoption of the report and accounts, said the general conditions, both as to the weather and the market prevalent in the second half of last year, were not the most favourable for their business. Bright days, few fogs, and short frosts, lightened the duty of both burners and stoves, and tended to restrict the sale of coke. The number of consumers, however, and the required make of gas continued to increase; and, having regard to the experiences of some of the neighbouring larger undertakings, their own modest 1¾ million cubic feet, added to the production of the previous half year, and making an increase of 5½ millions for the year, might, he thought, be regarded as reasonably satisfactory. That this increase, had it not been for the active competition they had had to encounter during the last few years, would have been larger, was perfectly obvious; but, nevertheless, that they had maintained their position, and maintained it to an increased advantage during the period their competitors had been gathering their new business in the district, assured, he ventured to claim, a permanency of the Company's interests in the future. The greater economy in the use of gas by the incandescent burner, which, while reducing the consumption, increased the light, and the admitted superiority of gas-derived light under these improvements both as to lighting power and cost, should be strong points in their favour in the long run of competition. The Directors were taking steps to ensure that these advantages were brought to the knowledge of their consumers, and also to those who might have been trying other methods of lighting. As the proprietors knew, their manufacturing plant had been improved in every direction with modern appliances, so much so that he thought, without undue boasting, he might say the Bromley Gas-Works were a very interesting object-lesson to any student, and to anyone who wanted to see how the manufacture could be done. The last attraction they were offering was a reduction in the price of gas to 2s. 11d. per 1000 cubic feet—the lowest price, he believed, hitherto reached in their pretty prosperous town of Bromley. The potentialities of gas were made visible in the most practical and convincing way in the recent exhibition at Earl's Court, to which, he hoped, most of the proprietors were able to pay a visit. The Directors issued some hundreds of invitations, with free admissions, to their consumers; the Company, of course, paying for those which were made use of. The exhibition might, he thought, without exaggeration, be described as an unprecedented display of the most brilliant lighting methods, of compact and powerful heating appliances, of quick-cooking refinements, and of motive power obtainable by the use of gas—portraying the wonderful development which had been made, more particularly during the last ten years, in every branch of gas application, and attesting, he could not help thinking, the genius of improvement and invention which had achieved such a marked success. With these facilities at disposal to enable the consumers to use the gas more economically and more efficiently, it was the Directors' desire to aid in every way their adoption. They were supplying all classes of these new fittings to any consumers who wished to have them, at a mere margin on cost price. He invited the consumers who might think their gas or lights might be better, to communicate with the Company; for (he proceeded) in this way they would seek to promote their mutual interests. He said mutual interests, because it should be remembered that, under the statutory sliding-scale for the division of profits in excess of the standard dividends, five-sixths of the profit must first go to the consumers in reduction of the price before the remaining one-sixth could be shared in dividends. Thus the prosperity of the gas undertaking of the town could not be said to be a purely company advantage as they sometimes heard alleged. Turning to the accounts, he said that, although they had sold more gas, it had yielded them £134 less rental, by reason of the reduced price, which was equivalent to a rebate to the consumers of fully £1000 a year. The coke market, too, had been unfortunately over-supplied for the time being. Lower prices had consequently prevailed; and the returns from coke had been diminished, as was seen, by £1050. Sulphate, too, with a slightly smaller make, had produced less by £150. Thus the disadvantages, after setting off the slightly improved returns from other revenue sources, caused the net revenue income to be less by £1180. On the expenditure side of the account, were many minor variations. He did not propose to refer to all of those which were due to what might be called the ordinary accretions of working expenses in a growing concern, because they were normal. Altogether the increased items represented £1503. On the other hand, they had less charges to meet by about £1740; so that, on the whole, there was a net decrease in the expenditure of £237, which, deducted from the net decrease of revenue—namely, £1180—left them with a less advantage on this account of some £942. Yet they had sufficient for the same dividends within £838, which they took from the balance brought forward—viz., £4236, which left £3398 to be carried forward in addition to the untouched reserve fund, which now amounted to £7323. When telling them at the last meeting of the Directors' intention to reduce the price of gas, he stated that they might find it necessary at first to bring in aid the balance carried forward, which existed for just such a purpose. He should be disappointed if the reduction in price which they had made did not very soon show that the public would readily consume cheaper gas in larger quantities. The debenture stock issued during the half year realized a fair price. All that was offered for sale by tender was bought. The Directors had applied to the Committee of the Stock Exchange for an official quotation for this debenture stock, concurrently with the ordinary stocks of the Company which were already on the list.

The DEPUTY-CHAIRMAN (Mr. Bertram Latter) seconded the motion.

Mr. SUTTON remarked that in the previous half year the unaccounted-for gas amounted to 2 million odd cubic feet. In the past half year they had made 5 millions or so more; and the unaccounted-for gas was 7,749,100 cubic feet. This looked as though the additional make was unaccounted for.

The CHAIRMAN said that, on the bare figures, Mr. Sutton was entitled to come to that conclusion. If, however, he would carry his memory back, he would find that the Midsummer unaccounted-for gas was usually very much less than that at Christmas. The meters were taken on certain days; and if the meters at Midsummer were left one day longer, there was a very small quantity of gas passing through them. If, however, they had a difference of one day at Christmas, the quantity was necessarily much larger. The make just at the time of the meter-taking at Christmas would be about four times the quantity at Midsummer; and therefore the quantity which escaped the meter record at Christmas would always be larger than at Midsummer. Then, again, they did not in the statement include the quantity of gas in stock; so that if in one half year the holders were full, and at the end of another comparatively empty, this would make a considerable difference in the quantity unaccounted for in the statement.

Mr. HELM considered that the condition of things shown by the balance-sheet was rather a serious one. They had about £840 to the bad in the half year, after allowing for the present rate of dividend; and this was borne by the amount carried forward from one half year to another. He thought this was an indication to the Directors that the utmost economy, in view of the competition they now had to bear, would be absolutely essential, both at the works and in the management; otherwise three more half years such as the one they had just had, would wipe out the balance in hand. He had no reason to think the management was otherwise than economical; he had every reason to believe that the affairs of the Company were managed as well as those of any other company with which he was connected.

The CHAIRMAN replied that, when they decided to reduce the price at Michaelmas, they contemplated that they might require to use a small part of the undivided balance. The Directors did not look forward to three or four balance-sheets showing a discrepancy. They considered the position carefully; and he believed the Board would meet the proprietors on the next occasion with a satisfactory result.

The motion was unanimously agreed to.

Proposed by the CHAIRMAN, and seconded by Mr. H. WYATT, dividends at the rates of 6 and 4½ per cent. per annum on the "A" and "B" stocks respectively were declared, both less income tax.

The retiring Directors (Messrs. Alexander Dickson, B. H. Latter, and H. S. Hughes) and Auditor (Mr. A. S. Hicks) were re-elected.

On the motion of Mr. HELM, seconded by Mr. ALFRED WRIGHT, the Chairman and Directors were heartily thanked for their management, and the officers for their services during the half year.

The CHAIRMAN expressed on behalf of himself and his colleagues their appreciation of the proprietors' recognition of their services. He was glad that Mr. Helm associated the expression of thanks with their officers. The Board were fully conscious that in their Engineer (Mr. W. Woodward) they had a most faithful, industrious, and efficient officer; and the Directors were pleased at all times to find the proprietors recognize, as well as themselves, the value of his services to the Company. Similarly he might say of the Secretary, that he was always attentive and assiduous in the discharge of his duties; and it was likewise satisfactory to find that the proprietors, as well as the Directors, appreciated the services he rendered.

This concluded the proceedings.

BOURNEMOUTH GAS AND WATER COMPANY.

The Ordinary General Meeting of this Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. W. Cash, F.C.A.) read the notice convening the meeting, and the report and accounts were taken as read.

The CHAIRMAN said he thought the shareholders would agree that the report and accounts were most satisfactory. Last half year, however, was not a grand one for gas companies—mainly owing to the remarkable mildness of the season. And, of course, when there was a mild season generally, they had an extremely mild one at Bournemouth. They could not have it both ways. The stock-in-trade of Bournemouth was the salubrity and mildness of its climate; and the Company had been a flourishing one owing to the development of the town through this. Therefore they must be content with the mildness of the climate in the sense that it extended the town; and they must do their best in the larger field which this offered them for developing the use of gas for lighting and other purposes. As was seen by the report, they had been busy the last six months in starting their new works at Poole, and in preparing to carry out the arrangements necessary for softening the water. He did not propose to delay the shareholders at any length in regard to these two points. When their new works at Poole were finished would be the time to talk about them, rather than at the beginning of their construction. At the present, all he had to say was that they were endeavouring, and should endeavour, to make these works thoroughly up-to-date—taking advantage of all the improvements that modern science could give them, so that they might have works at Poole which would be, he hoped, the admiration of all those who were likely to see them. With regard to the softening of the water, they were endeavouring to select the best system; and he had no doubt they would be ready to supply Bournemouth with the softened water in due time, and before the date by which they were bound, and had undertaken, to supply it. The Company still, of course, had to suffer from competition—particularly from the electric light. But this, he believed, would settle itself in time; and the consumers would find out that it was an advisable and a good thing to have gas-pipes in their houses, whether or not they used them constantly. The possibility of using them should always be there; and so he hoped the occupiers of houses would not be content to have houses in which gas-pipes were not placed. He thought they would hesitate to sign extreme agreements for electric lighting which bound them to all sorts of impossible things for an almost unlimited time, and agreements which, if strictly carried out, would prevent the occupiers of such houses lighting a match, or even having a night-light in their nurseries. Perhaps the most satisfactory feature of the past half year had been the issue of their new shares. They issued 1000 shares, as the shareholders knew, a few weeks ago; and in accordance with promises they made, tender forms were sent to all the shareholders. When he mentioned that the issue was more than five times subscribed, it would be seen that the Company still held a very good position, and that there were plenty of people willing to come into this "charmed circle" of shareholders. The result was that only a very few of the applicants were successful; but to those who did not succeed, he could hold out the hope that the Directors would be issuing some more of the shares before very long; and this would give them another opportunity of tendering. He was sorry to say they were having some little difficulty with regard to their assessments. The quinquennial period had arrived; and the authorities certainly were endeavouring to make such advances upon the Company's assessments that they felt bound to resist as far as ever they could. At present the assessments were beyond all ideas of what the Directors considered were fair, just, or reasonable; and therefore they had to appeal to a legal tribunal to settle the differences between them. The Directors did not want in any way to evade their just and proper duties; but at the same time they did feel, on behalf of the shareholders themselves, and the Company generally, that they could not sit perfectly still with the assessments the authorities were trying to impose upon them. The Directors were endeavouring to take what he thought the shareholders would all freely admit was the satisfactory course of referring the dispute to arbitration, instead of taking it into the Courts. He hoped that, if the authorities could agree with them on a thoroughly good man, they would each state their case to him; and he would then decide between them. At all events, they could not possibly consider the figures that had been put upon them by the authorities. And certainly, he thought, the Directors would be neglecting their duty if they quietly accepted them as they at present stood. At the same time, he hoped they would come to terms—he would not say with their adversaries—as quickly as they could. The Board would not spend a penny more on fighting than they could possibly help. He did not know there was anything more to add. The accounts spoke for themselves, and so he would simply content himself with moving their adoption.

Mr. CORBET WOODALL said he had pleasure in seconding the resolution. The account was, in his opinion, a most satisfactory one. They had in the course of the half year spent some £3000 more than in the corresponding one on repairs and renewals of the works, which most shareholders present would recognize as an almost necessary circumstance when the Company were engaged in the construction of new works and the demolition of old ones. They had maintained during the half year an excellent and thoroughly satisfactory supply of gas. With regard to the competition to which the Chairman had referred, they had recognized, for a considerable number of years now, that electricity was a serious competitor. Each tried to magnify the extent of the share that fell to its system; and he thought they were managing to hold their own very well. The time was fast arriving, if it had not now arrived, when there were more consumers transferred from electric supply to the gas, than from the gas to the electricity. They had a great benefit in this—that even in premises that were lighted by electricity, the advantages of gas for other purposes were so many and so great that it could not be dispensed with.

The motion was unanimously carried.

The CHAIRMAN remarked that they were on this occasion declaring their usual dividends; and he could also add that they were putting by the usual reserve. He therefore had pleasure in moving that dividends be paid at the rates per annum of 14 per cent. on the original shares, 7 per cent. on the "B" ordinary shares, and 6 per cent. on the preference shares, all less income-tax.

Mr. R. HESKETH JONES seconded the motion, which was unanimously carried.

Moved by Mr. HESKETH JONES, and seconded by Mr. A. W. OKE, the Chairman was re-elected to his seat at the Board; and afterwards, on the proposition of the CHAIRMAN, seconded by Mr. J. C. BENWELL, Mr. S. L. Rymer, J.P., was also returned.

Mr. Benwell was the retiring Auditor; and he was unanimously appointed.

Mr. OKE, in proposing a vote of thanks to the Chairman, Directors, Secretary, Engineer, and staff for their services, said that if the Directors and officers wanted a vote of confidence, he thought it was to be found in the fact that the new capital was subscribed for more than five times over. He was pleased to see that measures had been taken to have a show-room at Poole. The one at Bournemouth was certainly a model of what a show-room should be. Many directors of other companies had specially visited Bournemouth to see the show-room. In the case of a small company of which he (Mr. Oke) was a Director, Mr. Corbet Woodall had recommended them to start a show-room, and this had been a source of considerable profit to them, for such a small company. The report was a very satisfactory one, especially considering the very keen nature of the opposition from the electric light. Although the Directors found it necessary to appeal against the assessment for local rates, he was glad to hear that the Company were on such good terms with the local authorities that there was the prospect of their being willing to refer the matter to arbitration. He was looking to the time when the Legislature would assist gas companies by having some more uniform method of dealing with the question of rates. It appeared to him that gas and water companies had their accounts so well audited—in many cases by chartered accountants and official auditors—that their profits should not be a matter of such great difficulty to determine. He did hope that not only would the Company be saved these heavy charges, but the ratepayers as well. When they remembered that the Company were one of the largest ratepayers in the district, this was of considerable importance, as the result of proceedings of this kind affected them both ways.

Mr. F. G. BARRATT seconded the motion, and it was heartily agreed to.

The CHAIRMAN, having responded for himself and his colleagues, spoke highly of the services of the Engineer and Manager and the Secretary.

Mr. H. W. WOODALL briefly responded for himself and his staff at Bournemouth.

Mr. CASH, in also acknowledging the vote, said he was glad Mr. Oke had touched upon the question of the assessment of their property. As Mr. Oke said, the costs of these rating appeals, even if an appellant were successful, were largely paid by him, especially when, as in this case, he was often the largest ratepayer in the parish. He (Mr. Cash) thought the shareholders would be exceptionally proud when they saw the Company's new works at Poole, which were now being laid out and constructed. So far as his experience went, they would be exceptionally fine works; and they were being entirely designed by their Engineer and General Manager, and not by anyone outside the Company. This showed the advantage the Company possessed in having such a gentleman looking after their interests.

This concluded the proceedings.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. E. W. Drew, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said his first words that day must be to express very sincere regret at the loss of their late Chairman, Mr. Charles Horsley. He joined the Company as far back as 1872, and, like his distinguished predecessor in the chair, he had acquaintance with the dark days of the undertaking. He had, however, the great satisfaction of witnessing the progressive success of the Company. Mr. Horsley gave to the interests of the Company his best energies and his closest attention; and he (the Chairman) felt sure he voiced the feelings of the shareholders, as he did those of his colleagues and himself, in expressing sincere sympathy with Mrs. Horsley and the bereaved family. Turning to the report, he said he did not intend to go through a mass of figures, but merely to call attention to one or two of the items. Dealing first with the gas, they had carbonized some 5662 tons of coal, or 596 tons more than in the corresponding period of the previous year; and for it they had paid an average price of 17s. 2d. per ton, as against 17s. 6d. in 1903. Then they had sold 4¼ million cubic feet more gas in the half year just ended, which was an increase of something like 8½ per cent. This increase had been principally from prepayment meter supplies. The receipts from gas were £877 more, and from residuals £156 more; and altogether there was an increased profit of £1033. Of coke they had made 567 chaldrons more than in the same half of 1903; but it had fetched a somewhat lower price—the average being 10s. 2d. per chaldron, instead of 10s. 5d. Of sulphate they had made 9 tons more; and the average price had been rather higher—£8 0s. 8d. per ton, as against £7 16s. 10d. The make of sulphate per 100 tons of coal worked out to an average of 18¾ cwt. Turning to the expenditure side under the heading of gas, they had paid extra for the 596 tons of coal £427; and the working expenses showed an increase of £510. This was largely—almost entirely—due to the heavy outlay for the renewal of mains and services, including, of course, the cost of laying. Coming to the water part of the business, the receipts for water showed an increase during the last six months, as compared with 1903, of £1284; and most of this had been in respect of domestic supplies. The water

expenditure was just a little less than it was in the previous year—the same, within about £8. The net profit on the sale of gas, water, fittings, &c., after deducting interest and income-tax £1887, exhibited an increase of £1309; there having been a total profit for the six months of £11,950. He thought these figures showed substantial progress, and that they might congratulate themselves upon the results of the half-year's working. He concluded by moving the adoption of the report and accounts.

Dr. GLAISHER having seconded the motion,

Mr. E. R. KAIN drew attention to the large expenditure that had been incurred in promoting Bills in Parliament.

The CHAIRMAN, however, pointed out that the figures to which Mr. Kain referred represented the cost of all the Acts secured by the Company. There would be something more to add on account of last year's Act, as all the accounts had not yet come in.

Mr. DYER said he heartily congratulated the Directors on the increase of business; but he regretted the enormous expenditure on Acts of Parliament. It was unnecessarily severe. He was very sorry indeed to hear of the death of their Chairman, who for so very many years had attended the meetings. He (the speaker) had been a shareholder for thirty years; and he knew how sound Mr. Horsley was. They had had many chats together over the capital expenditure of the Company. He (the speaker) had always advocated keeping down the capital, which unfortunately in their case was very heavy. On one matter he was a little disappointed, and that was that the Directors had not squeezed out a little more dividend on the present occasion, seeing that they were carrying forward £3000 more. He also wished to call their attention to the fact that they were 1½ per cent. behind what they were before the increase in the price of coal some years ago. He was one of those who thought it was very unwise indeed to lose the confidence of the investing public; and he felt that if the Board continued in their present course, they would do this, because they had nearly got back to the old price of coal—within about 1s. per ton. He really did not see that the position of the Company justified the Board in keeping the shareholders this 1½ per cent. behind. He knew that the "D" stock on one occasion just before the increase in coal realized very nearly £200; whereas it was now only a little over par. This was a serious matter for the shareholders; and he really did feel that the Board might have advanced the dividend at any rate ½ per cent. He would be the last man in the world to urge the Directors to go too far in this respect; he believed in keeping down the capital account, and doing as much as possible out of revenue. But the status of the Company should be maintained, and care should be taken that they did not lose the confidence of investors.

Mr. A. W. OKE said that no doubt, in spending a large sum on parliamentary proceedings, the Directors did what was best; for it would have been ill-advised not to secure the greatest skill they could in this work. As to dividends, he sympathized with Mr. Dyer, but would remind him and other shareholders of the power that gas and water companies possessed of paying arrears of dividend. He hoped that this would be the policy of their Board, and that when the Company were in a sufficiently prosperous condition, they would turn their attention to the back-dividends. This power had in the past been exercised by well-managed companies; and the consequence was that such concerns enjoyed the confidence of investors.

Mr. DYER remarked that if he were a Director, he would not pay back-dividends; but he did ask the Board as soon as possible to get the Company into the position they occupied in 1899.

The CHAIRMAN said the question of dividend had had the very careful attention of the Board; but they felt that to maintain the last rate would be the wisest course. There were two or three reasons that influenced them in coming to this decision. They had not yet paid all the costs connected with their last Act; and then, as perhaps they knew, from Lady Day next there would be a reduction in the price of gas. Again, there were certain concessions made in the Act they had secured with regard to the rates for water for baths and houses of £30 and £20 a year. The Directors felt that until they knew exactly what these concessions would mean, it would be far wiser for them to do no more than maintain the dividend.

Mr. KAIN inquired whether since the last meeting water had been found in the area prescribed by Parliament. This was very important, because it was necessary to look forward.

The CHAIRMAN: I can say, with regard to that, we are taking steps which we hope will be satisfactory.

Mr. KAIN said he was glad to hear that; and he proceeded to make a reference to water-divining, which he suggested was a means of finding water that was worth the attention of the Board.

The report and accounts were then adopted.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were then declared for the half year at the rates of 7½ per cent. per annum on the "A" and "C" stocks, 6½ per cent. per annum on the "B" stock, and 5¼ per cent. per annum on the "D" capital gas and water stocks—all less income-tax.

The CHAIRMAN, in proposing the re-election of Mr. I. A. Crookenden and Mr. J. L. Chapman as Directors, remarked that the latter gentleman was chosen to fill the vacancy caused by the death of Mr. Horsley. Mr. Chapman, who was the Engineer and Secretary of the Harrow Gas Company, had many qualifications which the Board felt would be of advantage to the Company.

Mr. PHILLIPS seconded the proposition; and Mr. JAMES RANDALL heartily supported it, remarking that Mr. Chapman's large experience of gas affairs would be an advantage in many ways.

The motion having been carried,

Mr. CHAPMAN returned thanks on behalf of Mr. Crookenden and himself; saying that he highly valued the position given him. Three of the Directors of the Barnet Company were Directors of the undertaking of which he had been chief officer for over thirty years; and he felt it was a mark of their approval.

The retiring Auditor (Mr. C. P. Crookenden) was also re-elected; and the CHAIRMAN then proposed, and Mr. OKE seconded, a vote of thanks to the Engineer (Mr. T. H. Martin), the Secretary, and the officers, including the Cashier (Mr. Wright).

Mr. MARTIN, Mr. DREW, and Mr. WRIGHT briefly returned thanks; and the proceedings concluded with a similar compliment to the Chairman and Directors.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

A Good Ending at Caterham.

As the report presented at the meeting of the Caterham and District Gas Company last Thursday will probably be the last, in view of the approaching amalgamation of the undertaking with that of the Croydon Gas Company, it may be of interest to place on record a few particulars therefrom and from the accounts for the past year which accompanied it. In the first place there was an increase of 10·5 per cent. in the consumption of gas; the sales being 44,328,400 cubic feet out of a make of 49,373,000 cubic feet. The revenue produced was £8423, against £7856; the sale of residuals brought in £2243, compared with £2177; and the total receipts were £11,082, against £10,409. The expenditure was £7797, compared with £7426; and the balance carried to the profit and loss account £3285, against £2983. The net profit, after deducting interest on debenture stock, preference shares, and temporary loans, amounted to £2189, which added to the sum brought forward (£1125) gave a total of £3314 available for dividend on the ordinary shares. The Directors recommended a dividend of 9 per cent., subject to income-tax, leaving a balance of £1174 to be carried forward. In closing their report, the Directors expressed their hearty thanks to the shareholders for the great consideration invariably shown to them in the past.

A Concession to the Consumers at Cleethorpes.

The accounts presented at the half-yearly general meeting of the Cleethorpes Gas Company last Wednesday showed that the balance of profit available for distribution was £7384; and the Directors recommended the payment of dividends at the rate of 6½ per cent. per annum on the consolidated and new ordinary stock, less income tax; that £1000 be taken for renewals of works and plant; that £500 be placed to the insurance fund; and that the balance, amounting to £3325, be carried forward. The satisfactory increase in the business enabled the Directors to announce a further reduction in the selling price of gas from 2s. 9d. to 2s. 6d. per 1000 cubic feet, as and from the 1st of April next. An interesting analysis of the accounts was presented by the Engineer and Secretary (Mr. E. J. Brockway), which showed that the cost of coal and the working expenses (less residuals) came to £4549 18s.; being at the rate of 21s. 0·19d. per ton of coal, and 19·31d. per 1000 cubic feet of gas. The profit on the revenue account was £4760; being 21s. 11·85d. per ton of coal carbonized, and 20·22d. per 1000 feet of gas sold. But after paying income-tax, interest, &c., it was brought down to £4376. The dividend took £2558, leaving a surplus of £1818.

Progress Notwithstanding Oppositon at Hertford.

Though the Hertford Gas Company have had to withstand severe competition from electricity, the Directors were able to report at the recent annual meeting that the results of the past year's working had been highly satisfactory, due to the reduced cost of manufacture and the increased sale of gas. This is borne out by the following figures, compared with those for the year 1903, which are given in parentheses: Profit on the revenue account, £3727 (£2811); surplus after payment of dividends of 10 and 7½ per cent., against 8½ and 7½ per cent., £728 (£663); gas made per ton, 10,625 cubic feet (10,564 cubic feet); gas sold per ton, 9728 cubic feet (9488 cubic feet); unaccounted-for, 6·43 per cent. (8 per cent.). Although only 6 tons more coal were used, the Company sold nearly a million cubic feet more gas. This is highly creditable to the Manager and Secretary (Mr. Harry D. Duesbury). Notwithstanding a reduction of 2d. per 1000 cubic feet on the 31st of March last, the Company were able to pay for the first time their maximum dividends.

Increased Dividends at Ipswich.

Mr. D. Ford Goddard, M.P., had a satisfactory state of affairs to lay before the shareholders last week, in moving the adoption of the report and accounts for 1904 of the Ipswich Gas Company, of which he is Chairman. The increase in the sale of gas last year amounted to 5¼ per cent. This increase, while no doubt largely due to the prepayment system, was not altogether owing to it. All classes of consumption showed an expansion. The ordinary consumption had increased about 4½ per cent. over the previous year, the slot-meter consumption by 12½ per cent., and the cooker consumption by 15¼ per cent. In the last half of the year under review, the price of gas was 2s. 6d., instead of 2s. 8d. This was a very low charge, and one which he did not think could be equalled by any other company in the locality. Had there been no increase in the sale of gas during the past six months, the Company would have stood to lose £1573 by the reduction in price; but instead of this there had been a gain of £918. They had had a considerable strain put upon their works during some of the shorter days in the winter, when they had made nearly 2 million cubic feet of gas—a record make in the history of the Company. The sales of residuals had not yielded such good results; and he could not hold out any very large prospect of a brighter turn of affairs during the present year. As a matter of fact, coke was now very low in price, and rather difficult to sell. The expenditure of £4197 on capital account was entirely due to the increase of business. Their capital account per ton of coal carbonized was, however, very low as compared with other companies. With regard to revenue, the expenditure showed an increase in almost every item; but he did not regret this, because it was indicative of a growing business. If they worked out the figures according to the quantity of gas sold, the cost per 1000 cubic feet was less than in any previous year. The net result of the work of the year was that they had carried a balance to the profit and loss account of £11,973, as against £12,537. As to the competition of electricity, there were no doubt a large number of shops now lighted by electric light which formerly took gas; and during the past year the loss from this cause had been 2 million cubic feet, which was equal to ½ per cent. While they recognized, and very carefully watched the growth of, the electric light competition, they viewed it with no fear for their own business. They would no doubt as time went on lose more consumers of gas, but perhaps regain some who had been seduced by the charm of the new light, and who were repentant, finding the

pleasure to be a little too costly. A few were already abandoning electricity and coming back to gas. The report was adopted, and dividends were declared for the past half year at the full statutory rates of 13, 10½, and 10 per cent. on the "A," "B," and "C" stocks, making with the interim distribution 12⅜, 10¼, and 9⅜ per cent. per annum. This increased dividend, said the Chairman, was due to the natural working of the sliding-scale. The proceedings concluded with votes of thanks to the Chairman and the Engineer and Secretary (Mr. J. T. Jolliffe) and his staff.

A Question of Inadequate Salary.

The annual meeting of the Isle of Thanet Gas Company was held last Friday. The adoption of the report was moved by the Chairman, Mr. Lazarus Hart. In it the Directors congratulated the shareholders upon the working of the twelve months. The balance amounted to £11,553. From this £4267 was paid as interim dividend and debenture interest, and interest on temporary loans. The Directors recommended a dividend on the ordinary stock at the rate of 5½ per cent. per annum, free of income-tax. The quantity of gas sold during the year exceeded by 14,414,255 cubic feet that sold in 1903. The report was adopted; and the dividend declared. This being the end of the general business, the Chairman proposed a vote of thanks to the staff generally. In doing so, he referred in graceful terms to the services rendered by their Engineer and Manager, whom, he was sorry to say, they were about to lose, as he had accepted an appointment at Buenos Ayres. On behalf of himself and the Directors—and he was sure also of all the shareholders present—he wished him every success in his future career. Mr. W. A. Valon, in seconding the resolution, expressed the pleasure it gave him to add his congratulations to those of the Directors. Mr. Dougall, he said, had now been with the Company some years, and had during that time carried out much important work for the Company. They all knew that he (the speaker) had little or no faith in inclined retorts as an improvement on the horizontal method of setting; and, in his opinion, when used with Durham and other coals of this class, they were absolutely out of place. However, the balance-sheet presented to the shareholders for 1904 was a good one, and was very creditable to Mr. Dougall, who he was sorry was leaving them. This brought him to a matter on which he should like to express an opinion, which was that, in advertising for a successor to Mr. Dougall, the Directors were only offering what he considered a totally inadequate sum as remuneration for the position he was asked to occupy, and the services he would be called upon to render to the Company. Much had been said only lately in the leading technical journal about commissions and bribery; and a strong stand had been made against what were accepted generally as reprehensible practices of this kind. If they would allow him to say so, he considered it was equally reprehensible on the part of companies not paying a sufficient wage to their officers to remove them from the temptation they were otherwise under to increase their incomes by illegitimate means. He hoped, therefore, the Directors would reconsider this matter. No doubt, whatever they offered, they would have numerous applications for the position; but that was not the point. He was sure the salary offered would shut out a large number of the most desirable candidates. He congratulated Mr. Dougall on his appointment, and wished him success. The Chairman, in reply, said these were matters that must be left to the discretion of the Directors. At the same time, they intended to increase the stipend of the Engineer as they thought needful. Mr. Valon said that was not the question. The salary at present offered was not sufficient to secure the services of a properly qualified Engineer and Manager—at least he hoped not. The resolution was then put, and carried unanimously, and Mr. Dougall suitably replied on behalf of himself and his staff. The Secretary (Mr. T. C. Fuller) also replied for his department.

Price of Gas at Leighton Buzzard.

The profit made by the Leighton Buzzard Gas Company last year (£1954), with the amount brought forward (£662), was sufficient to admit of the payment of the maximum dividends and the allocation of £300 to the reserve fund, and leave a balance of £694 to be taken to the next accounts. At the annual meeting the Chairman (Mr. R. Richmond) said that since the report had been published, the Directors had decided to make a reduction of 2d. per 1000 feet in the price of gas. He congratulated the Secretary and Manager (Mr. C. F. Ruggles) on their work; remarking that he was particularly pleased to do so this year, because on March 3 Mr. Ruggles would complete 21 years as Manager of the Company. When they compared the business now with what it was when he came to them, he thought they might congratulate Mr. Ruggles, and also themselves on having had him all these years. When Mr. Ruggles came to them, the price of gas was 4s. 3d. per 1000 cubic feet; whereas now it was 3s. 7d. to ordinary consumers, and 3s. for engines if a certain quantity was used. Then they paid 8 per cent.; while now they divided the maximum of 10 per cent. These two facts were quite sufficient to prove the worth of Mr. Ruggles; and he proposed a vote of thanks to him and the staff. In acknowledging the vote, Mr. Ruggles said he thought they were reducing the price of gas a little too soon, as they did not know what was going to happen in the coalfields. He thought they could search England through for a small town the same distance from the coalfields without finding one where such consideration was shown to the public.

Sewerage Works Cause Leaky Gas-Mains at Newmarket.

The Chairman of the Newmarket Gas Company (Mr. R. Stephenson) gave the shareholders, at the annual general meeting on Monday last week, an idea of the loss the Company were sustaining through the sewerage operations which have been going on in the town. True, in 1903 the Urban District Council paid them £766 towards the loss they had incurred through the damage done to their mains; but, as the Directors had anticipated at the time, this sum would not be likely to reimburse them for their loss. They had ever since been spending money in searching for leaks, and had stopped a great many; but at present they were losing about as much gas as before. The leakage was 11 per cent. at the time the claim was settled; and it was practically the same now. New leaks seemed to occur almost as rapidly as old ones were stopped; but the Directors hoped that in a few years the loss of gas in this way would be substantially reduced. In other respects, the Chairman had a very fair account to give of the year's work. The new installation of regenerator retorts had proved a satisfactory addition to the carbonizing plant, and the works were in an efficient state, and capable of dealing with any reasonable increase of business. When, in 1895, the Company obtained their Act, Parliament, in the interest of the consumers, fixed the standard price to be charged for gas in Newmarket at 4s. 8d. per 1000 cubic feet. During the past two years the Company had been charging 3s. 8d. Mr. Stephenson ventured to think that very few other companies could show a reduction of 21 or 22 per cent. in so short a period. He considered the outlook good. There was no doubt that gas was the cheapest, brightest, and safest light, whether for indoor or outdoor use; and, in view of the effect produced by the high-pressure system of incandescent gas lighting, he did not think any public body at the present day would entertain the idea of replacing gas by any other kind of light. The year's work had resulted in a profit of £4163; and there was £5052 standing to the credit of the profit and loss account. He moved the adoption of the report, in which the Directors recommended the declaration of a dividend at the rate of 6½ per cent. per annum. Mr. Rodrigo seconded the motion, and it was carried. Mr. Musk proposed a vote of thanks to the Manager and Secretary (Mr. J. H. Troughton), to whom, he thought, the success of the Company was principally due. Mr. Troughton, in acknowledging the vote, said he did not know any gas company who paid such satisfactory dividends, compared with their capital and business, as the Newmarket Company. After thanking his Directors (especially the Chairman) for their encouragement, he remarked that he had never had a more able staff. The Company employed from 30 to 40 men, who earned fairly good money, and as employers they were doing some good in Newmarket. A vote of thanks was also accorded to the Directors, and acknowledged by the Chairman, who spoke in high praise of the work done by the Engineer and Secretary.

Increased Consumption at Reading.

The Directors of the Reading Gas Company were able to present to the proprietors a very satisfactory report on the past year's working at the ordinary general meeting last Tuesday. The total quantity of gas sold was 479,899,868 cubic feet; being an increase at the rate of 7·87 per cent. on the figures for the preceding year. In the twelve months covered by the report, 1828 new consumers were placed upon the books, 1758 additional cooking-stoves and gas-fires were fixed, and 368 public lamps erected. The contract with the Corporation for lighting the streets of the borough with incandescent burners was successfully carried out during the year; and the result is admitted to be a great improvement upon the old system. Extensive additions are being made in the manufacturing department, under the direction of the Company's Engineer and Manager (Mr. Douglas H. Helps); and it is expected that the plant will be brought into use in the autumn. New offices and show-rooms are being erected to meet the increasing requirements of the business. The revenue from the sale of gas last year was £67,916; residuals produced £23,109; the rental of stoves came to £2519; the laying of services and the supply of ordinary and incandescent fittings, mantles, &c., brought in £3445; and the total receipts were £96,999. The expenditure having been £79,454, there was left a balance of £17,545. The amount available for distribution was £22,219; and a dividend at the rate of 5 per cent. per annum was declared—making, with the interim dividend, 5 per cent. for the year. The Directors have deemed it advisable to build up a reserve fund; and they have therefore transferred £3500 from the profit and loss account to that fund, which, with the interest on the amount invested, brings it up to £19,391. In their report the Directors made feeling reference to the loss they had sustained by the sudden death, a few days after the previous general meeting, of Mr. Arthur H. Cane, who had held the secretaryship and served the Company faithfully and with marked ability for thirteen years, and to the appointment of Mr. A. Canning Williams, of Scarborough, as his successor. The Directors expressed their entire satisfaction at the way in which Mr. Williams had discharged his duties. By a rather singular coincidence, Mr. Edward E. Baker, who was for many years the Company's Engineer and Manager, died on the day preceding the meeting, as mentioned in another part of the "JOURNAL."

Working Class Appreciation of Gas at Wellington.

At the annual meeting of the Wellington (Salop) Gas Company last Tuesday, Mr. H. Shepard, the Chairman, in moving the adoption of the report, alluded to the unpretentious nature of the undertaking in the earlier years of its existence, and showed how remarkable had been its development. He pointed out that not only had its progress been beneficial to the shareholders, but the consumers had also shared in the general success. The Company had considerably lowered the price of gas as an inducement to the public to consume it in greater abundance; and he was very pleased to say that this had had the desired effect. The consumption had particularly increased among the poorer class of customers, which was doubtless due to the introduction of the slot-meter system. He was one of the first to advocate its adoption; and though his views were not at that time shared by many of his colleagues, he confidently predicted that this meter would become a valuable asset to the Company. Even his most ardent expectations had been fulfilled. He at the outset said he would be satisfied if the slot meters brought in the sum of £800 per annum—the amount the Company would lose if the public lighting were taken from them; but last year the return from them amounted £1554. Of course, this was not all derived from the supply of gas for lighting, because gas-cookers had enormously multiplied in recent years. These were provided gratuitously by the Company in the smaller houses; and it was obvious that the working classes highly appreciated their advantages, especially in the summer months. There had also been a greater demand for gas for manufacturing purposes and motive power, and the extension of the mains was still going on. The profit for the past year was £2328, against £2258 in 1903. The increase was very gratifying, especially in view of the fact that some of the residuals had not returned so much as in former years. The works were in splendid condition; and their general outlook was rosy. Mr. C. W. Leake seconded the motion, and it was carried. The usual dividend of 10 per

cent. for the year was declared. A vote of thanks was accorded to the Directors and the Manager (Mr. Herman Tapley); and the Chairman and Mr. Tapley acknowledged the compliment.

Water.

A Progressive Midland Water Company.

At the half-yearly meeting of the South Staffordshire Water Company last Thursday, the Chairman (Mr. Frank James), in moving the adoption of the report, said the undertaking was still progressive. The Company were laying on houses at the rate of between 3500 and 4000 a year, which was equivalent to something like a small town of 20,000 population. The increase in the water-rates shown in the accounts was due to the additional number of houses laid on. They had placed £2000 to the depreciation fund, which was started in 1889; and the total amount paid to it was £18,000. Dealing next with the balance-sheet, the Chairman said that £9818 had been expended on capital account, more than £4000 of which had been laid out on new stations, which had not yet come into operation to return anything. There was a decrease of £217 in 1904 as compared with 1903 in the engine charges; but the quantity of water pumped had increased by about 52 million gallons, and the difference in the cost had arisen from the fact that they had bought their coal at a lower figure. Like the poor, the rates were always with them, and they now had to pay £5915 against £5360. He thought it was quite time Parliament passed a Valuation Bill, so that all property might be equitably rated. The half-year's water-rates amounted to £64,476, compared with £61,838; and the balance of profit was £26,520, against £24,759. The Directors believed the time had now arrived when they might legitimately pay 7 per cent. dividend on the shares; and, after this had been done, there would remain a balance of £5099 to carry forward. He had been a Director of the Company for the last 43 years, and Chairman for about 31 years. They had worked hard for the goal they seemed now to have reached. He could recall to mind many difficulties they had experienced during their career—sometimes, for instance, when some of them were obliged to go to the bank for the purpose of getting money to pay wages on Saturday night; and troubles on other occasions which arose through shortage of water. But that day they had a good balance at the bank, and they were abundantly supplied with water to meet the requirements of the consumers. This was the goal which they had struggled hard to reach. Sometimes he had thought they never would reach it; but, happily, they had achieved their desire at last. Ten years ago their total capital amounted to £992,000; to-day it stood at £1,310,000. Ten years ago they paid a dividend of 5½ per cent., amounting to £15,817; now they paid 7 per cent., amounting to £41,420. In 1894 they carried forward £4779, and to-day they carried forward £5099. Ten years ago their depreciation fund amounted to £8800; now it was £18,687. He thought this was very fair progress to make; and they had a right to feel some satisfaction in knowing that out of a capital of £1,310,000 every class of interest, with the single exception of £225,000 of "A" stock, was receiving the maximum dividend to which it was statutorily entitled. Sir H. Wiggin seconded the motion, and it was carried. A dividend for the half year at the rate of 7 per cent. per annum was declared.

GAS v. ARC LAMPS FOR STREET LIGHTING AT CARDIFF.

The Cardiff Corporation have recently made application to the Local Government Board for powers to borrow £87,868 for purposes of electric lighting; and last Friday, Mr. H. Ross Hooper, M.Inst.C.E., one of the Board's Inspectors, held an inquiry at the Cardiff Town Hall, in regard to the application. Vigorous opposition was raised by Mr. Sam Hern, the Hon. Secretary, and a number of members, of the Cardiff Property-Owners and Ratepayers' Association, which now represents one-fourth of the rateable value of the town. One of the main points raised by the Association was in respect of the street lighting. It was pointed out by Mr. Hern that in the year 1900 the public lighting in Cardiff cost £11,152, while the estimate for the year 1905 was £17,000, which showed an advance of £6000 in five years. Taking into consideration the increase in the number of houses, shops, &c., this sum should not have been more than £450. His Association desired to impress upon the Inspector the necessity of greater economy on the part of the Corporation in the question of lighting. The 115 arc lamps, each of which was of 750-candle power, cost £14 each to light by electricity, or £1610 per annum; while estimates which the Association had obtained showed that 115 incandescent gas-lamps of the same candle power could be maintained at an annual cost of £805, reckoning the price of gas at 2s. 5d. per 1000 cubic feet. Mr. Hern closely questioned the Borough Electrical Engineer (Mr. A. Ellis) as to whether he considered electricity or gas was the cheaper illuminant for street lighting; and he replied that he would be a poor business man if, as an electrical engineer, he advocated the use of gas as against electricity. The Town Clerk (Mr. J. L. Wheatley) explained that the gas supply was in the hands of the Cardiff Gas Company, and was not a Corporation undertaking. Mr. J. Milner remarked that it was a very good thing it was not. At the conclusion of the inquiry, Mr. Hern said his Association, representing as they did the payers of one-fourth of the total rates, felt they had a right to protest against the action of the Corporation in using arc lamps which cost £1610 a year, while they might be using incandescent gas-lamps at half the expense.

Electricity v. Gas in Gravesend.—At the last meeting of the Gravesend Town Council, Mr. Schultz drew attention to the fact that while in 1902, when using gas for the market, the lighting cost only £64 3s. 11d., the amount in 1903, when they had electric light, was £171 4s. 11d., while last year the bill was £145 17s. Again the lighting of the streets cost £600 per annum more than when gas was the illuminant. Mr. Sandford followed, and urged that the question of reverting to gas should be considered. The Mayor abruptly terminated the discussion by ruling it out of order.

THE PUBLIC LIGHTING OF RYDE.

After full consideration, the Ryde Town Council have decided to enter into a new contract for three years with the Gas Company for the lighting of the streets, at a cost of £904 per annum. There are included in this price 300 one-light, 18 two-light, 3 three-light incandescent lamps, and 9 fire-alarm lamps. The tender of the Electric Light Company for 37 750-candle power arc lamps, 8 arc lamps for season only (all arc lamps to be replaced by two 40-candle Nernst lamps at 11.30), and 228 80-candle Nernst lamps, was £1356 per annum, including the cost of making necessary alterations to the existing lamp-columns.

An interesting speech was made by Mr. Randall, who pointed out what was being done in other towns with regard to incandescent gas lighting. He said that people who visited other places where there was electric lighting, and used their eyes, must see that Ryde was among the best-lighted towns. A gentleman from Brighton had told him that he was particularly struck by the brilliant way in which Ryde was illuminated. If they went to Portsmouth or Brighton, except in the main streets, they would see that there was no great advantage in electricity. By adopting gas they would not only save £450 a year, but would gain in several other ways. With the exception of arcs, electricity was not the best illuminant for the streets; and the Lucas lights were now running even arc lamps very close indeed. Mr. Holmes remarked that, on the figures submitted, they would, if the electric light was adopted, have to put on a 3d. rate in order to face the expenditure.

Mr. Hayden thought that, as they were about to lose their grip of this matter for three years, it behoved them to be very careful. He had noticed that when the Gas Company started their last contract, the lamps were very satisfactory; but the light deteriorated very much afterwards, principally owing to the Gas Company not keeping the mantles in good condition. He wanted the Committee to make certain that they would get a good light during the whole of the time. Mr. Barton, while unable to support electricity on the figures before them, felt that the Gas Company were asking too much, as it was asserted that the new lamps consumed very much less gas than those in use hitherto. Mr. Sweetman took the same line, and pointed out that though the economy of the new burners was admitted, the Company did not reduce the price. Mr. Mears agreed with the two previous speakers. But, in fairness to the Gas Company, he pointed out that the Directors had said the last contract was lower than it should have been; and besides this, twenty more lamps had been put up since the last contract was entered into. Looking therefore at the matter in all its bearings, he did not think the price was excessive. When they found towns that owned their own electric light works finding how much cheaper incandescent gas was than electricity, he did not think they could go far wrong in following their example.

This was evidently the general opinion, for the recommendation of the Committee that the Gas Company's tender should be accepted was adopted with only one dissentient.

HULL CORPORATION WATER SUPPLY.

Mr. Bancroft's Annual Report—Application of the Profits.

The Water and Gas Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc., Assoc.M.Inst.C.E.) recently issued his eighth annual report on the water supply to the city. He points out that the rainfall at Pearson Park during the past year was 21·25 inches, or only 79 per cent. of the 30 years' average, which is 27·02 inches. The rainfall on the Wolds was very low. At Wetwang it was only 18·475 inches, compared with 26·08 inches, the average for the previous ten years. The fall at Pearson Park during the last three months of the year was particularly small; being only 3·44 inches, or less than one-half of the average for the previous eight years—viz., 8·01 inches. Mr. Bancroft remarks that if the rainfall for the next three months is not exceptionally heavy, the depth of the water in the wells will be low for some time; and during the coming summer consumers will have to exercise economy in the use of water. The yield of the wells last year was: Springhead, 1,852,587,000 gallons; Cottingham, 1,573,379,000 gallons total, 3,425,966,000 gallons. At the former, the highest level was in May (59 feet), and the lowest in December (35 feet); at the latter, the highest level was in January (60 feet), and the lowest in December (37 feet). The estimated average population supplied within the water limits was: Within the city boundary, 253,800; beyond it, 4200—total, 258,000. Last year was a busy one in the main-laying department; 58,705 feet, or 11·11 miles, of new mains having been laid, and 20,499 feet taken up and disused—making a net gain of 38,206 feet. There were 150 additional fire hydrants fixed. The total length of mains on Dec. 31, 1904, was 1,260,551 feet, or 238·7 miles. The greatest quantity of water supplied from each pumping-station last year was: Springhead, 6,658,000 gallons, on the 6th of February; Cottingham, 5,765,000 gallons, on the 23rd of February. The greatest output was 11,601,000 gallons, on the 4th of August. The total supply per head for all purposes last year was 36·08 gallons, compared with 35·75 and 36·58 gallons respectively in the two immediately preceding years. The following are some additional figures from the report: Meters in use, 994; total supply by meter, 749,490,000 gallons; average meter supply per diem (313 days), 2,387,000 gallons; domestic and unmetered trade supply (average per diem), 7,262,000 gallons; do. per head, 28·14 gallons. Mr. Bancroft concludes by expressing his thanks to his Committee for their continued support and confidence, and to the staff for their zeal in the interests of the Water Department.

At a recent meeting of the Water Committee, the City Treasurer estimated at £59,920 the gross receipts on the water undertaking for the year now ending. The expenses will absorb £31,342, and the interest, sinking fund, and annuity charges £16,104; leaving a balance of £12,474. He suggested that £6000 should be applied in relief of the rates, £2800 to the purchase of land at Cottingham, and the balance of

£3674 placed to the reserve fund. A discussion took place upon the recommendation. Replying to a question, the Treasurer said the establishment of water-works at Hessle by the North-Eastern Railway Company had resulted in a loss of revenue to the Corporation of about £2000. Mr. Hanger remarked that the Railway Company paid nearly one-seventh of the rates of the city; but he questioned whether they ought to give them one-seventh of the £6000. There ought, he argued, to be some reduction to the consumers. Mr. Bentham suggested that the Committee should consider the question of reducing the present price of 6d. per 1000 gallons to manufacturers. Mr. H. Feldman observed that if this were done the profits on the undertaking would vanish. The expenditure of the Corporation had been heavy, and it was hoped to reduce the rates through the water-works and other undertakings. Mr. Hanger contended that the Corporation made too much profit out of the water-works. He thought they could afford to return 10 per cent. to the people who had their supply of water by meter. This would only take £2000, and it would be an inducement to manufacturers. As the Railway Company had gone off the Corporation supply to a large extent, they had no right to give them £800 or £900 which had been obtained out of the ratepayers' pockets. Answering a question, the Engineer said that in 1902 the Railway Company and their tenants took 155,787,000 gallons; in 1903, 124,732,000 gallons; and in 1904, 76,714,000 gallons. They were still the largest customers the Corporation had. Mr. Bentham considered Mr. Hanger's contention was sound finance; but, under existing conditions, he thought they had better not put it into operation this year. After some further remarks, the Treasurer's suggestion was adopted.

LIVERPOOL CORPORATION WATER SUPPLY.

Sequel to the Rivington Arbitration.

At the Municipal Offices, Liverpool, last Thursday, Mr. E. Pearce Burd, one of the Inspectors of the Local Government Board, held an inquiry into an application of the City Council for further borrowing powers under the Liverpool Corporation (Water) Act, 1902. The Water Committee were represented by Mr. J. T. Wood (Deputy-Chairman) and Mr. S. Porter; there being also present Mr. E. W. Pierce (Deputy Town Clerk), Dr. E. W. Hope (Medical Officer of Health), and Mr. J. Parry (Water Engineer). Mr. Pierce said the proposal was to borrow £100,000 in excess of the powers obtained under the Act of 1902 for the purchase of land in the Rivington watershed. By the Act, the Corporation were authorized to acquire land within the drainage area of the Rivington works, on which they were empowered to expend £255,000. Since the establishment of these works, changes had taken place in the neighbourhood; and the water was threatened with contamination. Under these circumstances, the Corporation had been advised by the Medical Officer of Health that it was absolutely necessary, in order to safeguard the works, that the lands now being purchased by the Corporation under their powers should be acquired. A few plots were still outstanding; but practically the whole area scheduled had been bought. It had been found that the estimate submitted to Parliament as to the cost of the land was generally accurate, with the exception of one case which went to arbitration, and in which the sum awarded was largely in excess of the Corporation's estimate. Really this was the reason for the present application. But as the award mentioned was the subject of litigation, he would not refer to it further than to say that the sum arrived at by the Arbitrator was about £100,000 in excess of the original estimate; and as the Corporation's calculations were disturbed, it had become necessary to apply to the Local Government Board for increased borrowing powers. There was no opposition, and Dr. Hope had held that it was essential for the sake of the purity of the water to acquire the whole of this land, as freedom from contamination could only be assured by ownership. Medical literature relating to the public health showed conclusively that the most serious outbreaks of typhoid fever and other forms of zymotic disease had been due to pollution of the watershed area, of flowing streams, or of the subsoil water which fed the reservoirs. Mr. E. L. Clare, who prepared the estimates, bore out the financial statement, and offered to submit privately to the Inspector the basis of his calculations. Mr. Wood said the Water Committee extremely regretted that circumstances had arisen in the course of their negotiations which had rendered it necessary to again approach the Local Government Board for borrowing powers; but they had applied themselves to the task before them—resolving that, in the public interest, these purchases should be completed as soon as possible. The Inspector, in closing a brief inquiry, promised to report to the Local Government Board.

OSSETT AND CASTLEFORD WATER SUPPLY.

Proposed Joint Purchase of the Deanhead Reservoir.

Negotiations have for some time been in progress between the Ossett Corporation and the Castleford Urban District Council with a view to entering into a joint scheme for the purchase of the Deanhead reservoir, the construction of which by a body of Commissioners was sanctioned by an Act passed in 1841. The reservoir is situated in the township of Scammonden, Huddersfield; and the available catchment area draining into it is 540 acres, though at present 15 acres are drained by a catchwater and turned into a bye-wash. The reservoir has a surface area of 15½ acres and a storage capacity of 70 million gallons. By raising the top-water level 6 feet, this storage could be increased to 110 million gallons. The dam is at present considered to be in a very fair condition, though slight leakages, of little consequence, are suspected; and, if necessary, these could be remedied at small cost. In spite of the slight indications referred to, the bank is believed to be generally sound. The average rainfall of the catchment area for a period of 32 years has been 47 inches. Allowing one-fifth to obtain the probable rainfall of three successive dry years and 14 inches for evaporation and absorption, there would be a net annual available rainfall of 24 inches, which is the basis on which calculations have been made. On 540 acres this gives 294 million gallons. Allowing 98 million gallons for compensation, a net available rainfall of 196 million gallons remains.

Ossett's present water supply is obtained from the Dewsbury and Heckmondwike Water Board, the agreement with which body expires in about four years. The present population of the boroughs is 13,400; and their consumption of water was 103 million gallons per annum.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 551.

Issue.	Share.	When Div.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22	−½	4 15 5
100,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 11	6½	Bombay, Ltd.. . . .	6¼—6¾	..	4 16 4
140,000	5	,,	6½	Do. New, £4 paid	4¾—5¼	..	4 19 1
50,000	10	Aug. 31	14	Bourne- 10 p.c. . .	29—30	..	4 13 4
251,8.0	10	,,	7	mouth Gas B 7 p.c. .	16—17	..	4 2 4
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Feb. 24	12	Brentford Consolidated	245—250*	+1	4 16 0
300,000	,,	,,	9	Do. New . . .	185—190*	−½	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	127—132*	−½	3 15 9
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb. .	105—108	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	228—233	..	4 14 5
246,320	,,	,,	8	Do. A. Ord. Stk. .	168—173	..	4 12 6
460,000	20	Sept. 29	10	British	41—42	..	4 15 3
100,000	Stk.	Feb. 24	6	Bromley, Ord. 5 p.c. .	114—119*	..	5 0 10
165,7c0	,,	,,	4¾	Do. do. 3½ p.c. .	90—94*	+¾	4 15 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11⅝—12¼	..	5 14 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
150,000	20	July 14	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	16⅜—17	+¼	5 17 8
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	9⅜—10	..	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,400,000	Stk.	Feb. 24	5 5/10	Commercial 4 p.c Stk. .	115—118*	+½	4 8 1
560,000	,,	,,	5	Do. 3½ p.c. do. .	111—114*	+½	4 7 9
450,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6½	Continental Union, Ltd.	117—120	..	5 8 4
200,000	,,	,,	7	Do. 7 p c. Pref.	140—145	..	4 16 7
424,070	Stk.	Feb. 18	5½	Derby Con. Stk. . . .	—	..	—
55,000	,,	Jan. 3	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	Jan. 27	11	European, Ltd. . . .	21—22	..	5 0 0
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 6
15,243,200	Stk.	Feb. 10	4 1/16	Gas- 4 p.c. Ord. . .	99—101	..	4 7 1
2,600,000	,,	,,	3¾	light 3½ p.c. max. .	92—94	..	3 14 6
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	112—114	+2	3 10 2
4,193,975	,,	Dec. 15	3	Coke 3 p.c. Con. Deb.	89—91	..	3 5 11
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	100—103	..	4 17 1
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	16—17	..	6 9 5
3,800,000	Stk,	Nov. 11	10	Imperial Continental .	212—214	+1	4 13 6
473,600	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	118—123	..	4 17 7
561,000	Stk.	Feb. 24	10	Liverpool United A . .	219—221*	..	4 10 6
718,100	,,	,,	7	Do. do. B . .	159⅜—161⅜*	..	4 6 8
306,083	Stk.	Dec. 30	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	Dec. 15	5	Malta & Medn., Ltd. .	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	10⅜—11⅛	..	6 1 9
1,565,892	Stk.	Feb. 24	4 6/10	Newc'tle & G'tesh'd Con.	106—106½*	..	4 6 10
406,c25	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91—92	+½	3 16 1
15,000	10	Feb. 24	10	North Middlesex 10 p.c.	19—20*	..	5 0 0
52,940	1/	,,	7	Do. 7 p.c.	13—14*	..	5 0 0
300,c00	Stk.	Nov. 30	8	Oriental, Ltd. . . .	148—151	..	5 6 0
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5⅛—6	..	4 3 4
796,980	5	Jan. 27	5	Do. 5 p.c. Pref. .	4⅞—5⅛	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
851,070	10	Oct. 13	7	River Plate Ord. . . .	12¼—12⅝	..	5 9 10
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—12½	..	4 16 0
70,000	50	Jan. 3	5	Do. 5 p.c. Deb. .	52—54	..	4 12 7
135,c00	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Feb. 10	5½	South Met., 4 p.c. Ord.	127—129	..	4 5 3
1,832,700	,,	Jan. 13	3	Do. 3 p.c. Deb.	89—91	..	3 5 11
575,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	120—123*	−½	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—127*	−½	3 18 9
112,533	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	130—135	..	3 14 1
502,310	Stk.	Nov. 11	5	Southampton Ord. . .	106—109	..	4 11 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 24	6¼	Tottenham A 5 p.c. .	122—127*	+½	4 18 5
338,c20	,,	,,	4¾	and B 3½ p.c. .	95—100*	+½	4 15 0
125,000	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	105—108	+2	3 14 1
182,380	10	,,	8	Tuscan, Ltd.	9¼—9⅝	+⅛	8 4 2
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	97—100	..	5 0 0
30,000	Stk.	Feb. 24	7⅜	Wands- A 5 p.c. . .	157—162*	+1	4 15 8
255,636	,,	,,	6¼	worth B 3½ p.c. . .	130—135*	..	4 12 7
60,000	,,	,,	5 1/16	and C 3½ p.c. . .	108—110*	−¼	4 18 7
57,564	,,	Dec. 30	3	Putney 3 p.c. Deb. Stk.	77—82	..	5 13 2
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord. .	104—106	..	4 14 4
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—128	+2	3 18 2
193,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—110	..	3 12 9

Prices marked * are Ex div.

Castleford supply by agreement New Fryston and part of Tadcaster Union; the population of the whole area being estimated at 32,522, with an annual consumption of 138,523,000 gallons. This totals to a population of 45,922, which it is proposed to supply under the scheme, requiring 241,523,000 gallons of water. The suggestion has been made that the necessary compensation water should be provided by taking an additional gathering-ground below the present catchment area. To obtain the full benefit of the total available rainfall, it would be necessary to practically double the storage capacity; and the construction of a new reservoir, immediately above the present one, of equal capacity is suggested, as the cost would be practically the same as that of making a smaller reservoir, in addition to raising the present dam. The present reservoir would necessitate the erection of a water-tower and other arrangements for drawing off water at different levels, &c. Calculating the rate of increase of consumption on that of the past ten years, the engineers who have prepared and reported on the scheme reckon on a sufficient supply for 27 years, and then for a further 50 years for Castleford and Ossett alone, or until 1996.

The proposed scheme is to lay a trunk delivery main from filters, which would be necessary, as is usual with water from these watersheds. This main would be of a total length of 29⅛ miles to the meter-house at Willow Bridge, Castleford, and of a capacity to provide for a delivery of 1½ times the mean daily flow up to the end of 61 years; and to lay a branch main to Ossett from near Thornhill. Of the total length, 23 miles would be under public roads and footpaths, and the remainder under fields. Two break-pressure tanks would be necessary on the way. An approximate estimate of the cost likely to be incurred in carrying out such a scheme is altogether £127,000, including £51,000 for piping, £12,000 for the purchase of the existing works, and £3000 for the cost of an Act of Parliament.

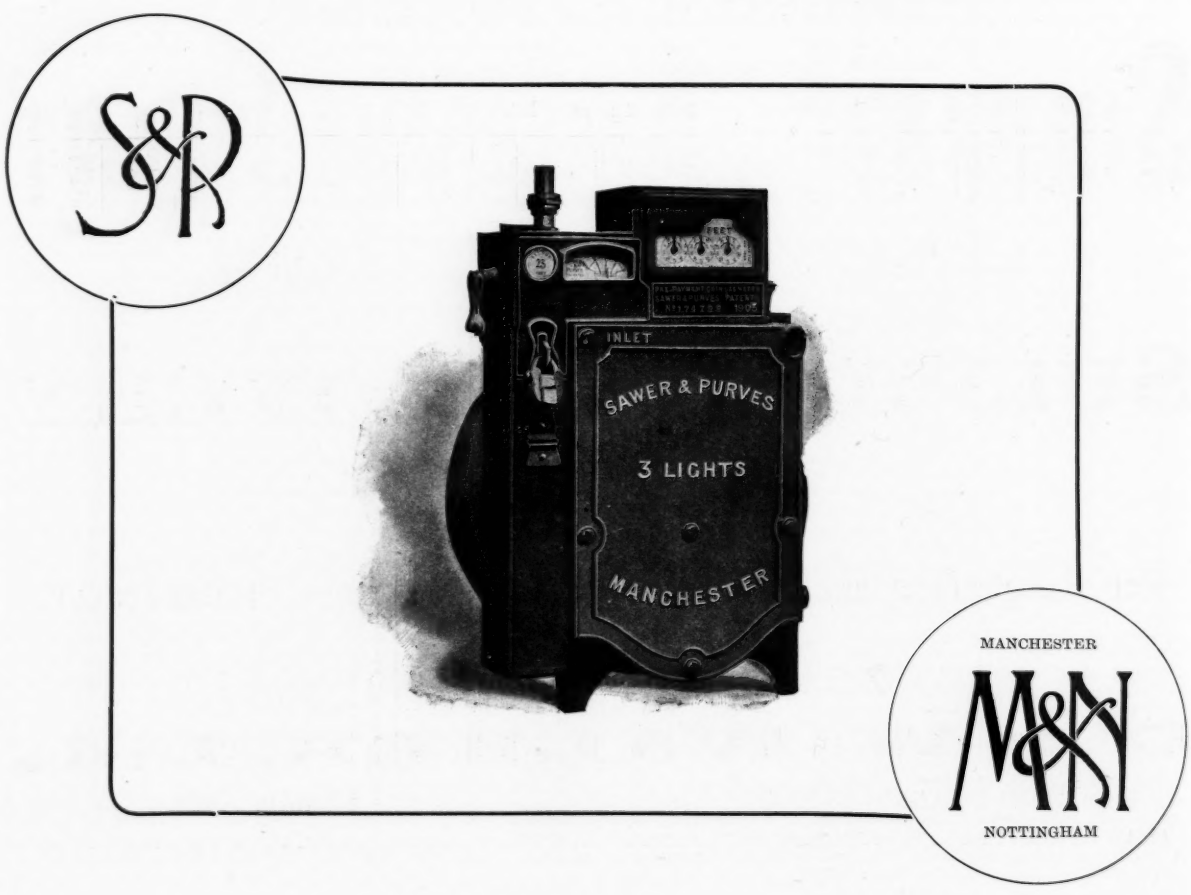
It is suggested that a Bill might be promoted in the session of 1906, and the capital expenditure up to that time would be the cost of the Act, the purchase of the reservoir, and the land for the compensation reservoir. Terms between the two authorities have been discussed at joint meetings in Wakefield, and are considered fairly equitable.

WATER-WORKS FOR BOLSOVER.

It may possibly be remembered that one of the Provisional Orders granted in the session of 1903 was to authorize the formation of a Company to construct works for the supply of Bolsover and the district with water. Operations were commenced in the following October; and the works have just been completed. The pumping-station is located within a short distance of the Bolsover end of the tunnel on the Lancashire, Derbyshire, and East Coast Railway. Two gas-engines of 25 and 12 horse power respectively operate the force-pumps, of which there are two, of the three-throw plunger type. The gas for the engines is manufactured at the pumping-station by a small plant which works automatically. Belting is used for connecting the engines with the pumps, and coupling gear is fitted on to the shafting so as to throw the load of the two pumps on to either or both engines as desired. The pumps are of equal capacity. One is employed to force the water into the settling-tanks close at hand, and the other for forcing the quantity of water required up to the storage tanks between Hillstown and Palterton. The water in the latter case has to be raised 300 feet high, through pipes three-quarters of a mile in length. The three settling-tanks have each a capacity of 25,000 gallons, and they are placed above a storage tank of 40,000 gallons capacity. The three upper tanks are capable of purifying and softening 18,750 gallons of water per hour. The gas-engines, gas plant, and pumps have been supplied and put down by the Railway and General Engineering Company, Nottingham, under the direction of Mr. John Gee; the settling and storage tanks and apparatus, by Messrs. Mather and Platt, of Manchester. Mr. John Anderson has superintended the work of erection. The two tanks near Hillstown have a storage capacity of 30,000 gallons each, and are erected on masonry and iron columns which give them an elevation of more than 50 feet above the ground level. Only a portion of the houses within the water area—which includes Bolsover proper, the model village, new Bolsover (Carr Vale), Palterton, Hillstown, and Scarcliffe village—have up to the present been connected with the mains; but the work of bringing all the customers on to the service is being proceeded with very energetically. The model village of New Bolsover will be supplied from the lower storage-tank near the pumping-station. The water charges have been fixed on the basis of the rateable value of the property, and the scale is identical with that in force at Chesterfield.

REFUSING PAYMENT ON ACCOUNT OF THE QUALITY OF WATER SUPPLIED.

Last Saturday week, at the Chesterfield County Petty Sessions, the Staveley Coal and Iron Company were summoned at the instance of the Chesterfield Rural District Council for non-payment of water-rate and meter-rents for the quarter ending Michaelmas, amounting to £68 19s., and of water-rate on rateable value for the quarter ending Christmas, amounting to £132 13s. 10d. Mr. Swanwick, who appeared for the Company, said the resistance that such a large undertaking was offering to this water-rate might appear a strange circumstance. But as large employers of labour, and as owners of many houses at Barrow Hill to which the water was supplied, the Company naturally felt themselves to be in the position of trustees of the general welfare of their employees, and bound to see that their workpeople were supplied with wholesome pure water. The Council had taken upon themselves to supply the population of their area, and were therefore bound to supply the people with pure, wholesome water. But as was well known, the water supplied was by no means pure and wholesome. For many



weeks past, the water supplied to the Staveley district had been polluted to such an extent that, not only was it unfit for drinking purposes, but it was unfit even for washing, as it emitted a stench that could not be endured in a house. Under these circumstances, the Company were justified in refusing to pay the rate. Had the water been pure, they would not have resisted payment; but as it was so abominably bad, they felt entitled to take every step they could to improve the supply. The proceedings ought any way to have been in a Civil Court. As the summons had been issued more than six months after the rate became due, the matter was on that account out of the jurisdiction of the Court. The rate became due at Midsummer. At this point, the collector said it was in respect of the Michaelmas quarter that the proceedings were being taken; the Midsummer rate had been paid. The confusion was due to a clerical error. The Bench overruled the objection; and Mr. Swanwick then raised the point that the Court had no jurisdiction in cases where the amount involved was over £20. He said he had a special objection in desiring the case to be tried in a Civil Court. The Chairman (Dr. Court) remarked that the Bench were excessively sorry to have to overrule this point also. All that Counsel had urged as to the quality of the Staveley water was quite true; but the Bench felt that the Company must pay the rates. There was one other course open to them, and that was an appeal to the Local Government Board.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Seeing is said to be believing, which is not altogether a very perfect expression; but its meaning is quite well understood. In the sense of it, the members of the Western District of the Scottish Junior Gas Association, in the course of their visit to the Provan Gas-Works this afternoon, must have had their beliefs, or opinions, quickened upon a good many subjects which had not before been brought home to them with so much vividness as looking upon the actual thing at work is calculated to do. They were made as free of the works as if they had been the owners of them; and, under the guidance of Mr. J. Webster, the Manager of the works, and other members of the staff who are familiar with them, there was not anything within the enclosing walls that was not fully explained to everyone who wanted to know. There was a most gratifying turnout of the members—almost the full strength of the District. If there was one thing that was looked at with more interest than another it was the coal-handling plant, which was described by Mr. Webster in his paper read a fortnight ago. What was specially commented upon with regard to this exceedingly handy tool was the adaptability of the conveyor, the facility with which it is diverted and sent to any part of the works desired, and the noiseless way in which it does its work. Mr. A. Wilson, the Gas Engineer to the Corporation, favoured the after-proceedings with his presence, and in the course of his remarks gave utterance to some wholesome truths which the members of the Association highly appreciated and ought to profit by. His countenancing of the gathering this evening is but another proof of the deep interest Mr. Wilson takes in the Association. As to the after-proceedings, it was a happy thought to keep the members together for a little while. The Hon. Secretary—Mr. W. M. Mason—had made most admirable arrangements for the concert.

Mr. H. Russell, the Convener of the Gas Committee of the Falkirk Corporation, made a remark at a meeting of the Town Council on Monday which is worthy of reproduction. It is proposed to hold an exhibition of gas appliances in the Town Hall in April or May. In speaking to the proposal, Mr. Russell said that the reason why the Council had not been in a position to take up the question of the introduction of gas-cookers was that they had not hitherto been able to manufacture an adequate quantity of gas. When their new works were sufficiently advanced, they would be able to meet the requirements of the whole lighting area. He was of opinion that they should begin at once to try to cultivate this business as much as possible, by taking up the gas-stove trade. If they looked at Perth, Coatbridge, and other towns of the same size as Falkirk, they would find that the number of gas-stoves in use was, on an average, one for every 3½ consumers of gas. Over the whole of the Falkirk lighting area they had only one gas-stove for every seventy consumers. To put them in the same position as the other places he had mentioned, they would require to have 1600 or 1700 gas-stoves in use. The Falkirk district was the home of that trade in Great Britain, and by the general introduction of gas-stoves they would be benefiting an important local industry, as well as benefiting themselves. The Town Clerk and the lighting officials were appointed to make arrangements for the exhibition.

A Committee of the Falkirk Corporation recommended, after careful consideration, that the machinery and plant in the new gas-works, with the exception of the exhausters, as to which consideration is delayed, should be driven by electric motive power, and that the Electric Light Committee of the Corporation should be asked to supply the current. The recommendation was agreed to.

At the same meeting of the Town Council, Mr. Flannigan moved that a Committee be appointed, with powers to arrange for supporting a petition by the Council against the proposed Provisional Order of the North British Railway Company. The part of the Order which is objected to is that which relates to the making of a railway to the new gas-works—a subject upon which there has already been much trouble. Mr. H. Russell moved that no Committee should be appointed. He saw nothing in the deviations that they should not be able to adjust with the Railway Company in half-an-hour, without costing the ratepayers a sixpence. In the course of a somewhat heated discussion which followed, it was stated by Bailie Mitchell that the Railway Company were to give them a railway to the gas-works according to plans passed by the Town Council, and that they were now proposing to carry through different plans altogether; and the Town Clerk stated that he

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had already written to the Company on the subject, and they had ignored him. It was ultimately agreed to appoint the Committee, but to instruct them to endeavour to come to terms, so as to avoid a Parliamentary fight.

Following upon the resolution of the Dundee Town Council, mentioned last week, to stop all pensions to Corporation servants, it has been reported to the Gas Committee this week that the Town Clerk had written to all the pensioners in the Gas Department that their pensions and allowances ceased with the last payment. The Committee authorized Mr. Stevenson, the Convener, and Mr. A. Yuill, the Manager, to employ the men, as far as possible, with certain exceptions.

On Aug. 21, 1902, a claim was made upon the Corporation of Dundee, on behalf of Mr. Guthrie, of Craigie, for a casualty, amounting to £4485, as due in respect of a portion of the site of the Corporation Gas-Works. It was announced some time ago that part of the titles to the gas-works had gone amissing, one effect of which has been the hanging up of this question as to the casualty. A casualty is a sum which the owner of land—in Scotland he is called the "superior"—is entitled to on certain eventualities, such as the transfer of the lands, or at stated intervals, according to the title. The Town Clerk of Dundee—Mr. W. H. Blyth Martin—after great trouble in searching old registers in Edinburgh and Forfar, was able to establish that the large general claim was untenable; but he found that with regard to a fringe of the land, which had been feud out more than a century ago, a casualty was clearly due. This has been adjusted at the sum of £120. In submitting this result to the Gas Committee on Tuesday, Mr. Martin advised them to get rid of the payment in all time coming by commuting the casualty, which could be done by a payment of £300, that sum to include the £120. The Committee expressed satisfaction at the manner in which the subject had been dealt with by the Town Clerk, and agreed to adopt his suggestions.

In the Dundee Sheriff Court last Wednesday, James Sievwright, a labourer, residing in Watson's Lane, was charged with the theft of threepence from a prepayment gas-meter. He pleaded not guilty, and evidence was led. A police sergeant stated that when he arrested the accused, he had been drinking. A gas inspector stated that when he arrived at the accused's house he found that the meter had been wrenched from its position, and that there was sufficient gas in the house to have caused an explosion if anyone had gone into the place with a light. The meter had been considerably damaged, and would cost about £3 to repair. Sievwright denied that he tampered with the meter, and asserted that when he arrived home he found the meter lying on the floor in the middle of the room. The prosecutor said the practice of smashing meters was becoming a rather serious question for the Gas Commissioners. On the day this theft was committed, other three cases of smashing meters were reported. During the past year between 100 and 150 cases of tampering with meters had occurred. It was absolutely necessary that something should be done to put a stop to this class of offence. Sheriff Campbell Smith found the case proved, and imposed a fine of 12s., with the alternative of twelve days in gaol, and ordered caution to be found for 21s., or a further period of imprisonment for twenty days.

The extraordinary want of rain which has characterized the past six months—in some places a longer period—is beginning to tell upon water supplies. It is reported that the water in store in the reservoirs of the Edinburgh and District Water Trust on Tuesday amounted to 1,812,020,000 gallons, which was a decrease of 54½ million gallons during the immediately preceding fortnight, and a decrease of 927 millions upon the quantity at the corresponding date last year. The rainfall from Jan. 1 to Feb. 21 was, at Glencorse, 2·54 inches, as compared with 6·73 inches in the corresponding period of 1904, and 11·16 inches in 1903. At Gladhouse the rainfall for the same periods was, respectively, 2·10, 5·88, and 9·44 inches.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 25.

Sulphate of Ammonia.

There has again been a quiet market and a further slight shrinkage in values. Owing to extensive business done in advance, the large makers, on the one hand, have been under no necessity to make further sales; while, on the other hand, corresponding purchases, aided by unfavourable weather, have enabled buyers in Spain and on the Continent to postpone further purchasing. But the smaller makes have had to be dealt with, and the makers have had to grant some concession in order to effect sales. The closing quotations are £13 per ton f.o.b. Hull, £13 2s. 6d. per ton f.o.b. Liverpool, and £13 5s. per ton f.o.b. Leith. The forward position has been neglected, and quotations are for the most part nominal.

Nitrate of Soda.

This article has also experienced a quiet market pending the effective opening of the spring demand, but spot prices remain 11s. 1½d. to 11s. 4½d. per cwt., according to quality.

LONDON, *Feb.* 25.

Tar Products.

Markets are decidedly quiet all round, and prices as a rule are slightly easier, as there is very little business doing. In benzol, there are now sellers of 90 per cent. at 10d. per gallon f.o.b. London; but consumers decline to pay this price, as sales are reported in the North of England at 9d. for export. In 50-90 per cent., there is nothing fresh to advise. Some small parcels are reported to have been sold in the North at 7d. for home consumption; but particulars have not transpired. There is really no business whatever doing in toluol and solvent; and the position remains the same. In anthracene, the position is unchanged;

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BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled) .	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . .	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA. . . .	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.) .	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract) . .	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract) .	500,000
WINDSOR ST., BIRMINGHAM (Second Contract) . .	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil) . .	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled) . .	125,000	CRYSTAL PALACE DISTRICT .	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.) . . .	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract). .	250,000	ENSCHEDE (HOLLAND) . .	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract) . .	750,000
		KINGSTON-ON-THAMES . .	1,750,000	TORONTO (Fourth Contract) .	1,000,000
		ACCRINGTON.	500,000	MONTREAL, ONT. (2nd Cont.) .	1,800,000
				HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND IN ADDITION, 7,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

and it seems pretty evident that there will be no business doing in this article for some little time to come, as consumers are not at all inclined to consider business at makers' ideas. In all probability they are well covered for the present year; and it is therefore likely to be some little time before they are prepared to discuss the question of their next year's supplies. Carbolic acid continues quiet. Sales are reported by makers at 1s. 10½d.; while consumers state that they find no difficulty in purchasing at 1s. 10d. The position of this article is decidedly peculiar. Manufacturers as a rule do not seem at all anxious to sell; while consumers report purchases at prices much under those which makers state that they have recently realized. A fairly large business has been done in crystals during the past week; but prices continue to rule very low, and dealers are reported to be offering at considerably under the prices quoted by the leading makers. Creosote continues quiet, and although the larger makers still quote 1¾d., business is reported at 1½d. per gallon from some of the smaller works. In Lancashire there appears to be a fair quantity offering for early delivery, and there are certainly sellers at 1 3/16d.; while in the Yorkshire district business is again reported at 1¼d. per gallon, although the largest makers still decline to accept this price. In pitch there is really nothing fresh to advise; but prices are a little easier all round. Probably the Belgian strike has had a depressing effect upon the market. London makers are still reported to be quoting 35s.; but certainly dealers are prepared to accept considerably less than this figure. As regards South Wales, consumers appear now to be fairly well supplied, and are only open to consider business over the last six months of the year. In Belgium, it is stated that a fairly large contract has been concluded for delivery over the whole of the present year; but the price mentioned is a very low one, and considerably under those quoted by makers generally. In Lancashire, there is still a good deal offering for delivery over the next two or three months; but just at present consumers do not seem at all inclined to contract, unless at a considerable reduction on existing quotations. In London, the position is undoubtedly the strongest, as there are practically no stocks, and makers are only open to consider business for April-June shipment.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 33s. 6d. to 34s.; east coast, 32s.; west coast, 30s. 6d. to 31s. Benzol, 90 per cent., 9½d. to 10d.; 50-90 per cent., 8d. Toluol, 7½d. Crude naphtha, 3d.; solvent naphtha, 8½d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1½d. to 1⅝d.; North, 1¼d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 10d. Refined naphthalene, £4 to £8; salts, 17s. 6d. to 20s. Anthracene, "A" quality, 1⅛d. to 1¼d.; "B" quality, unsaleable.

Sulphate of Ammonia.

Business has been very quiet during the past week, and prices are slightly easier all round. The Gaslight and Coke Company still quote £13 10s.; but there is no business possible at this price. The South Metropolitan Company's quotations remain unchanged, and they are asking £13 15s. for March delivery; but buyers will not entertain business at this figure. In Leith, there has been little business doing during the past week. Makers as a rule maintain their quotations; but dealers are reported to have accepted rather lower prices for prompt delivery. There is little or nothing doing at Hull for early shipment; buyers not being at all anxious for prompt delivery. There are sellers at £13 5s. for March shipment; but buyers are not prepared to pay this figure at present, although they are reported to have offered £13 2s. 6d., which was declined.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal trade throughout Lancashire is not only in a good condition at the present time, but in some parts of the country as well as in Manchester, the prospects are decidedly favourable. Nearly, if not quite, a dozen new cotton mills are either being projected or are in course of erection; the iron industry shows a decided improvement; and the trade by the Ship Canal is steadily increasing. The Canal is being deepened to admit the largest trading vessels; and at Partington and Cadishead the foundations of two new coal-tips are being put in. Just now the demand for house coal is fair, for engine fuel good, for forge rather quiet, for shipping good, for coke fair, and for cannel steady. The quotations are: Best slack 7s. per ton at the pit, medium 6s. 6d., common 5s. 3d. to 6s., best house coal 13s. to 14s., secondary 10s. to 12s., and common 9s. to 10s.

Northern Coal Trade.

There is at present much dulness in the Northern trade, as the demand for coal for the Continental ports has now fallen to its normal proportions. In the steam coal trade, the exports are limited, and some of the collieries are now working short time, so that the range of prices is weaker. Best Northumbrian steams are quoted at 9s. per ton f.o.b., but in a few cases lower prices are named. Second-class steams are 8s. 3d.; and steam smalls are now plentiful at from 4s. 6d. to 5s. per ton. As to gas coals, the local demand begins to show some decrease; but the output is fairly taken up. Prices are based on from 8s. to 8s. 9d. per ton f.o.b. for Durham gas coals, according to quality. The result of the tenders for gas coals for Naples and for Aarhuus has been made known; but as the figures include the freights, tax, &c., there is some difference of opinion as to the f.o.b. price of the coal. It is probable that it is from 7s. 10½d. to 8s. 6d., according to quality. The delivery, it is to be remembered, is largely in summer. Coke shows little change; and gas coke is quiet, though the lessening output must soon steady the market.

Scotch Coal Trade.

Trade is a sort of hanging, there being an apparent indecision as to how matters will settle down after the strike of miners in Germany. This is an effect which will soon pass off, and normal conditions may

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Hot Coke Fed to Producer.

WRITE FOR ESTIMATES.

PATENT "DWARF" INCLINED BENCH.

NEW CONVEYOR CO., LTD., SMETHWICK.

be looked for shortly. The shipping side is the one in which there is least activity. The home demand is the better of the two. The prices quoted are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 282,077 tons—an increase of 16,248 tons upon the previous week, and of 95,720 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,504,069 tons, an increase of 284,953 tons upon the corresponding period of 1904.

Explosion at the Portslade Gas-Works.—An explosion of a purifier at the Portslade Gas-Works last Tuesday morning resulted in four men being injured. It caused a fire to break out; but the Gas-Works Fire Brigade, under Captain Packer, quickly extinguished it. The injured men are making good progress.

Hull Corporation Gas Supply.—The Water and Gas Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc., Assoc.M.Inst.C.E.) has submitted his estimates in regard to the supply of gas in the current financial year. He puts the revenue at £12,250, and the expenditure at £9605; leaving a gross profit of £2645. Of this amount the interest and sinking fund will absorb £2354.

Proposed Sale of Water-Works at Kettering.—The Kettering Urban District Council have decided to apply to the Local Government Board for a Provisional Order to sell the water-works at Weekley to the Kettering Rural District Council for the sum of £2500; the latter to pay all expenses. The purchase will be made by the Rural District Council largely on behalf of Burton Latimer, where trial wells have been sunk without success.

Sale of Shares and Stock.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards placed new issues of capital by order of the Directors of the North Middlesex, Grays, and Harrow and Stanmore Gas Companies. Some £10 ordinary shares in the first-named Company, carrying dividend at the rate of 7 per cent. per annum from the 1st prox., fetched £14 5s. to £14 15s. each; and some 4 per cent. perpetual debenture stock, £102 to £102 10s. per £100. A parcel of fully-paid £10 "B" shares in the Grays Company (last dividend £5 12s. per cent. per annum) sold at from £10 5s. to £10 10s. each; and 500 £10 "C" shares in the Harrow and Stanmore Gas Company realized £13 5s. to £13 7s. 6d. per share.

Gas Lighting of Schools.—At the meeting of the Education Committee of the West Ham Corporation on Monday last week, the Works Sub-Committee reported that they had visited the Water Lane and Upton Lane Schools, and inspected the work carried out there by Messrs. W. Sugg and Co., Limited, by way of experiment, for the improvement of the gas lighting. The Sub-Committee were highly satisfied with the results, and had now under consideration the question of the general adoption of the system of improved lighting. As already reported in the "JOURNAL," the experiment was undertaken, and Messrs. Sugg were engaged to carry it out, as a direct outcome of a visit by members of the Committee to the exhibition at Earl's Court.

Carburetted Water-Gas Plant for the Devonport Gas-Works.—For a considerable time the Gas Committee of the Devonport Corporation have had under consideration the question of supplementing the existing manufacturing plant by water-gas apparatus. A Sub-Committee was appointed to visit various gas-works with the view of ascertaining which system would probably best answer the requirements of Devonport. They have reported in favour of carburetted water gas, though the "blue" water gas system was recommended by engineers. At a meeting of the Committee on Friday, it was decided to adopt the proposal of the Sub-Committee, and accept the tender of Messrs. S. Cutler and Sons for carburetted water-gas plant. The decision is, however, subject to confirmation by the Council.

The Saltley Gas-Works Explosion.—A report has been issued by the Gas Committee for presentation to the next meeting of the Birmingham City Council on the subject of the explosion at Saltley last October. From this it appears that the cost of repairing the damaged buildings, plant, and machinery on the works is estimated at £11,617; but of this £5757 has been received under a policy of insurance. The cost of repairing private property is estimated at £1175. A full investigation by the Chief Engineer (Mr. Henry Hack) has led to the conclusion that the explosion was in all probability caused by the valve to No. 3 holder (to which the gas should have been passing at the time) being closed, as were also the inlet-valves to the other holders. In this case, of course, there would have been no other outlet for the gas being made than through the lutes or water seals of the purifiers. The valve arrangements at Saltley were similar to those at other large gas-works; but on the advice of Mr. Hack, a system has since been adopted that will prevent the inlet-valves of all holders being inadvertently closed at the same time. So far as can be ascertained, all the plant was in good working condition at the time of the occurrence.

The Explosion at the Formby Gas-Works.—We learn from Mr. J. H. Buckley, the Manager of the Formby Gas-Works, that the account of the explosion there on the 13th inst., which was given in the "JOURNAL" last week (p. 520) from a local correspondent, was not quite accurate. It appears that preparatory to the inspection the safety-valve on the boiler and the cock of the gauge had been opened and the lid of the manhole lifted. After allowing time for the water to pass off, Mr. Fred. Buckley, the brother and assistant to the Manager, looked into the boiler to see the extent of the incrustation inside the manhole. He had put his hand forward with a light when a violent explosion occurred. He was blown away by its force and fell unconscious; his face and right hand being very badly burnt and bruised. He was removed to the Manager's house, where Mrs. Buckley rendered first aid until medical assistance could be procured. His wounds were dressed, and he was conveyed to his home. We are pleased to learn that he is progressing favourably. It was at first feared that his eyes would be very seriously affected; but his hand and forearm seem to have shielded them from the force of the blast. It is impossible to account for the explosion.

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Cheap Gas for Power at Wellingborough.—With a view to encourage the use of gas for motive power purposes, the following scale of discounts has been arranged by the Wellingborough Gas Company: For an engine consumption during the quarter not exceeding 25,000 cubic feet, 10 per cent.; from 25,000 to 62,500 feet, 12½ per cent.; from 62,500 to 125,000 feet, 15 per cent.; from 125,000 to 250,000 feet, 17½ per cent.; from 250,000 to 500,000 feet, 20 per cent.; and over 500,000 feet, 22½ per cent.

Cagliari Gas and Water Company, Limited.—At the meeting of the Company this day week, the Directors will report a net profit on the past year's working of £12,527. Adding the balance brought forward (£3898) makes £16,425. An interim dividend absorbed £4500; and the Directors recommend a final dividend at the rate of 8 per cent. per annum, amounting to £6000, and making 7 per cent. for the year, together with a bonus of 5s. per share. These payments will total to £12,375, and leave £4050 to be carried forward.

West Ham Gas Company.—The report and accounts which will be submitted at the half-yearly meeting of the West Ham Gas Company to-day show that there is a balance of £26,057 upon the net revenue account for the six months ending Dec. 31. The Directors recommend dividends of 5 per cent. per annum upon the 5 per cent. preference stock and upon the consolidated ordinary stock of the Company in respect of the past half year. These dividends will amount to £23,272, leaving £2785 to be carried forward, and making the total balance of net revenue carried forward to date £8302. In the sale of gas (including automatic consumers) there was an increase of 10·6 per cent. as compared with the same half of 1903. The increase in the case of the ordinary consumers was 3·6 per cent. The demand for prepayment supplies is still maintained; and 2949 additional installations on this system were put in operation during the six months. The Directors have placed £1000 to the insurance fund out of the revenue.

At a meeting of the West Surrey Water Company held last Tuesday, dividends were declared at the rate of 7 per cent. per annum upon the 7 per cent. shares, and at the rate of 8 per cent. per annum upon the 10 per cent. shares.

At a meeting of the Herne Bay Water Company last Tuesday, a dividend at the rate of 5½ per cent. per annum was declared upon the ordinary stock for the half year ended the 31st of December.

Messrs. Ashmore, Benson, Pease, and Co., Limited, have received an order from the Falkirk Gas Commissioners to supply and erect, at their new works at Thornhill, two water-cooled condensers of a capacity of 1¾ million cubic feet per day.

The Gas Companies at Warsaw have had to warn consumers to burn gas sparingly. Soldiers are engaged in gas manufacturing operations, assisted by a few skilled men; but they are not able to produce enough gas to satisfy the normal requirements of the city.

A contract for a complete ash elevator plant for the boiler-house of the Islington Borough Council has been placed with Messrs. Graham, Morton, and Co., of Leeds. The elevator is driven by a 3 brake horse power motor running at 500 revolutions per minute.

Messrs. Joseph Taylor and Co. have received instructions from the Perth Corporation Gas Department for the supply and erection of a double detachable ammonia, acid, and steam-pipe saturator; also for the covering with sheet lead of the saturator foundations and surroundings, new sulphate drainer, ammonia and acid catch-box, &c.

With reference to the paragraph on the approaching issue of Rand water stock which appeared in the "JOURNAL" last Tuesday (p. 520), the following report, which is being circulated in City circles, was published in the "Financial News" the same day: "Messrs. Speyer Bros. have succeeded in obtaining the £3,500,000 Johannesburg 4 per cent. water loan by submitting the highest tenders. It appears, however, that originally the London and Westminster Bank had secured the loan at 97½ per cent., when Messrs. Speyer, entering for the first time into South African financial operations, made a slightly higher offer—viz., £97 11s. per cent—and so surpassed all their competitors, including the London and Westminster Bank itself. The curious thing is that these two great concerns, thus brought into competition, have a common factor in one of the best-known of City men, who is at once a member of the Speyer firm and a Director of the London and Westminster Bank."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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Agency Wanted by Engine Builders. No. 4335.

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CONDENSERS (NEW OR SECOND-HAND). Louth Gas Company. Tenders by March 9.
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DRAWINGS AND PATTERNS FOR EVERY DESCRIPTION OF GAS PLANT AND APPARATUS. By Auction, March 10.
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Gas-Works (complete) for Disposal.

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Loans.

DERWENT VALLEY WATER BOARD.
OSSETT CORPORATION.

Company Meeting.

CAGLIARI GAS AND WATER COMPANY. Offices. March 7. Three o'clock.

Stocks and Shares.

ASCOT GAS COMPANY. March 7.
CARDIFF GASLIGHT AND COKE COMPANY. March 7.
SOUTHEND GAS COMPANY. March 7.
WATER AND GAS DEBENTURES. Langbourne, Malton.
WOKING GAS COMPANY. March 7.

TENDERS FOR

Coal and Cannel.

HEYWOOD GAS DEPARTMENT. Tenders by March 14.
MIDDLETON CORPORATION. Tenders by March 4.
MILFORD HAVEN GAS DEPARTMENT. Tenders by March 13.
SALFORD GAS DEPARTMENT. Tenders by March 16.

Condensers (New or Second Hand).

LOUTH GAS COMPANY. Tenders by March 9.

Engine, &c.

BROADSTAIRS AND ST. PETER'S U.D.C. Tenders by March 11.

Fire-Clay Goods.

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RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 15.

Gauges and Thermometers.

BIRMINGHAM GAS DEPARTMENT. Tenders by March 9.

General Stores, Ironmongery, Oils, Paints, Chemicals, &c., &c.

BIRMINGHAM GAS DEPARTMENT. Tenders by March 9.
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Lime and Cement.

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Purifier Grids.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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GEORGE MILLER AND CO., Tar Distillers,
40, West Nile Street, GLASGOW.

THE Firm who advertised for a Can-vasser in the "JOURNAL," under No. 4322, beg to THANK the applicants, and to inform them the position has been FILLED UP.

GAS Engineer wishes to recommend Young Man as Meter Inspector, Collector, Timekeeper, &c. Thoroughly trustworthy. Abstainer.
Apply, by letter, to No. 4330, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer, with over 20 years' Practical Experience, is prepared to accept ENGAGEMENT as Engineer, Manager, or Secretary.
Apply, by letter, to No. 4329, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (age 36) desires situation as HEAD STOREKEEPER in Gas-Fitting Trade. Experienced. Good References. Four Years in present berth.
Address No. 4346, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMAN, holding good official position in large Suburban Gas Company, desires to represent large Firm of Manufacturers doing business with leading Gas Companies in United Kingdom and Ireland, or British Isles.
Address, No. 4342, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHOW-ROOM ATTENDANT, CANVASSER, &c.
YOUNG man, of good address, would like to submit his References and Experience to a Gas Company's Engineer and Manager, with a view of obtaining position as above. Well up in Modern Incandescent Lighting, Fittings, Stoves, and Appliances generally. Thorough Practical Experience in all branches of a Gas Company's Fitting Department.
Address No. 4349, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OUTDOOR SUPERINTENDENT.
AN Energetic, Tactful Man, Age 35, who has for the last Ten Years successfully Managed a small Gas Undertaking, will shortly be free and prepared to take over a post as above. Well up in Main and Service Laying, General Gas-Fitting, able to advise on all matters connected with uses of Gas, prepare Estimates, and able to take Sole Charge of the Distribution Department. Moderate Salary.
Address No. 4348, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A PRACTICAL Gas-Works Plant Con-structional Engineer, with Workshop, Outside Erection, Drawing Office, Estimating and Commercial Experience, accustomed to Travelling and Negotiating large Contracts, is open for an Engagement, either as TRAVELLING REPRESENTATIVE or as LONDON AGENT to a Good Firm manufacturing or supplying Fire-Clay Goods, Retort Benches, with Regenerator Furnaces, Gas Plant, Conveyors, Cast-Iron Pipes, Gas-Fittings, Meters, Producer-Gas Plants, Gas-Engines, &c.
Address No. 4347, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINE Builders in the North would be glad to take AGENCY for selling any kind of Machinery to be driven by such Engines, chiefly Large and Medium sizes. A good all-round old established connection, particularly in Scotland and the North of England.
Address No. 4335, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Main and SERVICE LAYER.
Apply, stating Age and Wages required, with *copies* of recent Testimonials, to the SECRETARY, Bexhill Water and Gas Company, BEXHILL.

WANTED, immediately, by a large Provincial Gas Company, an experienced BOOK-KEEPER, thoroughly competent to Take Charge of the Accounts and prepare Annual Statements.
Apply, by letter, stating Age, Experience, and Salary required, to No. 4345, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CORPORATION LOANS.
THE Ossett Corporation require Loans, amounting to £10,000, on the security of the revenue from the Gas Undertaking and the Rates.
For Particulars, apply W. BROOK, Town Clerk.

£1000 Water and Gas Deben-tures FOR SALE, with Two Months accrued Interest. First-Class investment. Paying punctually 4½ per cent. Money required by Trustees for Division among Beneficiaries abroad.
Apply, FRANK LANGBORNE, Solicitor, Malton, YORKS.

WANTED, Three Good Second-Hand PURIFIERS, about 10 feet square; also Lifting Gear, Valves, and Connections.
Full Particulars and where can be seen, to Box 465, Judd's Advertising Offices, 5, QUEEN VICTORIA STREET, E.C.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

TESTING PLANT FOR SALE—We have several small Sets of GAS APPARATUS, including Retorts, Condensers, Scrubber, Purifiers, Gasholders, overhauled and guaranteed, or New throughout.
FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

FOR SALE.
PULSOMETER Pump, size No. 7, with sliding suction-pipe. Good as new. Boiler, second-hand, vertical 10 ft. by 4 ft. 6 in., Two Cross Tubes, and Mountings complete, in good Order.
Apply, MANAGER, Gas-Works, PEEBLES, N.B.

PURIFIERS, &c., FOR SALE—Sets of 4 ft., 5 ft., 6 ft., 8 ft., 9 ft., 10 ft., 12 ft., 18 ft. squares; also 16 ft. by 12 ft., &c. SCRUBBERS, 8 ft. by 60 ft. 10 inch, 18 inch Square METERS. EXHAUSTERS up to 50,000 feet per hour in Stock. GASHOLDERS and TANKS, also New. State requirements.
FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE.
THE Lichfield Gas Company will shortly have the following PLANT for disposal.
One Anderson's EXHAUSTER, belt driven by horizontal Steam-Engine, equal to 10,000 cubic feet per hour.
One untrussed GASHOLDER, 44 feet diameter by 14 feet deep, four Columns, Girders, Chains, and Weights.
Purchasers to remove same from present site. No reasonable offer refused. May be seen at any time by arrangement with the MANAGER, Gas-Works, Lichfield, STAFFS.

LOUTH GAS COMPANY.
TENDERS are invited for New or Second-Hand CONDENSERS, complete with Valves and Connections for 300,000 cubic feet of Gas per diem.
Prices and Particulars to be sent on or before March 9, 1905, to
PHILIP ALLISON,
Secretary.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)
THE Gas Committee invite Tenders for the surplus TAR made at their Works during the Twelve Months ending March 31, 1906.
Particulars may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knotts Lane, Colne, Lancs., and delivered not later than Monday morning, March 20, 1905.
The highest or any Tender not necessarily accepted.
FRED THORPE,
Engineer and Manager.
Gas-Works, Knotts Lane,
Colne (Lancs.), Feb. 20, 1905.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR FIRE-CLAY GOODS.

THE Gas and Water Committee invite TENDERS for the supply of about 400 Feet of Stourbridge or other approved quality FIRE-CLAY RETORTS, about 15,000 FIRE BRICKS, TILES, &c., and about 20 Tons of FIRE-CLAY.

Tenders to be sent in on or before Saturday, the 11th day of March, 1905, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, and endorsed "Tender for Fire-Clay Goods."

The Committee do not bind themselves to accept the lowest or any Tender.

Specification and full Particulars on application to

T. N. RITSON,
Engineer and Manager.

Gas and Water Offices,
Boundary Road, Ramsgate.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Water Committee invite TENDERS for the purchase of the Surplus TAR (150,000 Gallons or thereabouts) to be made between the 1st of April, 1905, and 31st of March, 1906.

Tenders to be sent in on or before Saturday, the 11th day of March, 1905, addressed to the Chairman of the Gas and Water Committee, Gas-Works, Boundary Road, Ramsgate, and endorsed "Tender for Tar."

The Committee do not bind themselves to accept the highest or any Tender.

Further Particulars on application to

T. N. RITSON,
Engineer and Manager.

Gas and Water Offices,
Boundary Road, Ramsgate.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR SULPHURIC ACID.

THE Gas and Water Committee invite TENDERS for the supply of about 225 Tons of best BRIMSTONE ACID (what is known as 80 per cent. acid with a specific gravity of 142° Twaddel), to be delivered in equal monthly quantities between the 1st of April, 1905, and the 31st of March, 1906.

Tenders to be sent in on or before Saturday, the 11th day of March, 1905, addressed to the Chairman of the Gas and Water Committee, Gas-Works, Boundary Road, Ramsgate, and endorsed "Tender for Sulphuric Acid."

The Committee do not bind themselves to accept the lowest or any Tender.

Further Particulars on application to

T. N. RITSON,
Engineer and Manager.

Gas and Water Offices,
Boundary Road, Ramsgate.

GOUROCK TOWN COUNCIL.

THE Gas Committee of the above Corporation invite TENDERS for the immediate Sale and Removal from their Gas-Works of One Telescope GASHOLDER (outer Lift 40 feet diameter; inner, 38 ft. 6 in. diameter; depth, 14 ft.) with Cast-Iron Columns, Girders, Back-balance Weights, &c., complete. Only top course of plates of Cast-Iron TANK, with Column Brackets, for sale and to be removed. The Holder is in good condition, and can be seen working. No reasonable offer will be refused.

Sealed Tenders, endorsed "Removal of Gasholder," to be lodged with the subscriber not later than Monday, the 6th of March, 1905.

The Committee also invite OFFERS for the following PLANT in use at their Works:—

1.—One Set of Five Annular CONDENSER PIPES, 18 ft. by 31 in. outside, and 21 in. inside, 8-inch Connection.
2.—One Young's WASHER, 10 ft. by 6 ft., Eight Tiers of Washing Plates, 8-inch Connection, and
3.—Three PURIFIERS, 12 ft. by 6 ft. by 3 ft. 6 in. deep, and Four Tiers of Grids and Change Valve, 8-inch Connection.

The above are in good condition, but have to be removed shortly for Plant of larger capacity.

Sealed Tenders, endorsed "Offers for Gas-Works Plant," to be lodged with the Subscriber not later than the 6th of March, 1905.

A. DOUGLAS MURRAY,
Town Clerk.

Gourock.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the supply of LIME, ACID, FIRE-BRICKS, GAS, WATER, and GUN-METAL FITTINGS, OILS and PAINTS, IRONMONGERY, STREET-LAMPS, SHOVELS, IRON and STEEL, BOOKS and STATIONERY, as may be required, for the Year ending March 31, 1906.

Also for WROUGHT-IRON TUBES, and LEAD and COMPO. PIPES, for the Half Year ending the 30th day of September, 1905.

Further Particulars and Forms of Tenders may be obtained on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, Glam.

Samples may be inspected at the Gas and Water Offices, Pentre, Glam., from March 6 to 11 inclusive.

No Form of Tender other than that issued by the Council will be accepted.

The Contractor will be required to pay the standard rate of wages recognized in the district.

Tenders endorsed "Contract No. 1, 2," &c., as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before 10 a.m. on Wednesday, the 15th of March, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk.

Gas and Water Offices,
Pentre, Glam., Feb. 23, 1905.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of the COAL and CANNEL required at their Works during a period of One Year.

Forms of Tender may be obtained on application to Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Coal," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than 3 p.m. on Thursday the 16th of March, 1905.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Feb. 24, 1905.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of April, 1905.

Tenders for the Tar or Liquor separately to be sent in not later than Monday, March 13, 1905, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

For Conditions, apply to Mr. W. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any Tender for the Tar or the Liquor separately.

The highest or any Tender not necessarily accepted.

ARTHUR T. PATTINSON,
Town Clerk.

Feb. 15, 1905.

THE Middleton Corporation are prepared to receive TENDERS for the supply of CANNEL and GAS COAL, delivered at the Middleton Railway Station in such quantities and at such times as the Gas Manager may require. Quantity required, about 10,000 Tons.

Tenders, addressed to the Chairman of the Gas Committee, must be delivered at my Office on or before Saturday, the 4th day of March, 1905, endorsed "Tender for Coal or Cannel."

The Corporation do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained, by written application only, to Mr. E. E. J. Anderson, Gas Engineer.

All persons or firms Tendering must pay their workpeople the Standard or Trades Union rate of wages at least, and observe the trade conditions which attach to the various kinds of work for which a Tender is sent in.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton, Feb. 15, 1905.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

TENDERS are invited for any of the STORES named in the following lists, to be supplied to the Corporation Gas-Works in Birmingham, Swan Village, and Wednesbury, during the Year ending the 31st of March, 1906:—

Bolts, Nuts, &c.,
Brass Fittings,
Brass and Gun-Metal Castings,
Brass Padlocks,
Brushes,
Canvas Hose, Belting, &c.,
Coke Bags, Shoots, &c.,
Drysaltery, Paint, and Chemicals,
Engine Packing,
Files, Steel, Steel Tools, &c.,
Galvanized Iron Buckets and Pipe,
Gas-Fittings,
Glass,
Gauge Glasses and Lubricators,
Hand Lamps,
Incandescent Burners, Mantles, &c.,
India-Rubber Goods, Hose, &c.,
Iron Barrows,
Iron Castings, Machined or Fitted.
Iron Chains,
Ironmongery and Wood Screws,
Lamp Columns.
Leather Belting, Stokers' Mitts, &c.,
Leather Bags,
Malleable Iron Castings,
Meter Stays, Pipe Hooks, Lamp Brackets, and Valve Keys,
Nails, &c.,
Oils, Lubricants, &c.,
Pressure Gauges,
Purifier Grids,
Retort Lids, Mouthpieces, and Fittings,
Riddles,
Ropes, Flax, &c.,
Scouring Flannel and Dusters,
Shovels, Forks, and Stokers' Tools,
Slates,
Street Lanterns,
Thermometers,
Timber, Meter Boards, &c.,
Tools, &c.,
Valves, &c.,
Wood Turnery,
Wire Ropes,
Wrought-Iron Work, Forgings, &c.,

N.B.—The Stores in the foregoing list include articles to be supplied to samples, which will be shown at my Offices on March 1, 2, and 3, from Eleven a.m. to Four p.m.

Boiler Composition,
Brass Sheet, Tubes, and Rods,
Bricks (Brown),
Cast-Iron Pipes,
Cement, Lime, &c.,
Copper Bars, Gauze, and Sheets,
Cotton Waste, and Sponge Cloths,
Incandescent Burners and Mantles,
Iron and Steel Bars and Sheets,
Iron (Gas and Steam) Tubes and Fittings,
Iron Borings,
Lime for Purifying,
Oatmeal,
Paving Stones,
Red and White Lead,
Roofing and Boiler Felt,
Tin Plates and Sheets,
Tin, Lead, and Compo. Tube,
Zinc Sheetings and Scrap.

Conditions and Forms of Tender, price 5s. each (this amount to be returned on receipt, on or before March 9, of a *bonâ-fide* Tender, in accordance with the Conditions, for any portion of the Stores), may be obtained at my Office.

Separate Forms of Tender are issued for each Contract, and applicants must specify the Forms required.

G. HAMPTON BARBER,
Secretary.

City Gas Offices, Council House,
Feb. 27, 1905.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of 9000 Tons of COAL.

Specification and Form of Tender may be obtained upon application to Mr. W. Whatmough, Gas Manager.

Sealed Tenders, endorsed "Coal," to be sent to me not later than Tuesday, March 14, 1905.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood.
Feb. 16, 1905.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Twelve Months from the 25th of March next, at per ton of 200 Gallons, delivered into Contractor's Tanks at the Company's Works.

Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Saturday, the 11th of March next; but the Directors do not bind themselves to accept the highest or any Tender.

By order,
W. A. PADFIELD,
Engineer and Secretary.

Gas Light Offices, Exeter.
Feb. 22, 1905.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 850 Tons of large GAS COAL, and about 350 Tons of Bituminous STEAM COAL, to be delivered between the 1st of April, 1905, and the 31st of March, 1906, the whole of the Coal to be fresh-hewn, Clean, and Free from Impurities.

Further Particulars and Forms of Tender can be obtained on application to the undersigned.

Sealed Tenders, endorsed "Tender for Coal," addressed to the Chairman, Gas and Water-Works Committee, to be sent in not later than the 13th of March next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS H. LEWIS,
Clerk.

Milford Haven, Feb. 23, 1905.

SELBY URBAN DISTRICT COUNCIL.

TO WELL SINKERS.

THE Urban District Council of Selby, Yorkshire, invite TENDERS for the construction of a BORING, 400 feet deep, to be carried out adjacent to the Boring recently completed at the site of the New Water-Works.

Copies of the Specification and Form of Tender, together with any other Information, can be obtained from Mr. Percy Griffith, M.Inst.C.E., F.G.S., 54, Parliament Street, Westminster, S.W., or from Mr. Bruce McGregor Gray, Assoc.M.Inst.C.E., Town Hall, Selby, upon payment of a sum of Five Pounds, which will be returned on the receipt of a *bonâ-fide* Tender.

Tenders must be delivered, in the proper sealed Envelopes, endorsed "Tender for Duplicate Boring," addressed to me at the Town Hall, Selby, not later than Twelve noon on Friday, the 10th day of March, 1905.

By order,
JNO. HY. BANTOFT,
Solicitor,
Clerk to the Urban District Council.

Town Hall, Selby,
Dated Feb. 16, 1905.

BROADSTAIRS AND ST. PETER'S URBAN DISTRICT COUNCIL.

RUMFIELDS PUMPING-STATION.

PUMPING MACHINERY.

TENDERS are invited for the Construction, Delivery, and Erection, at the above Station, of a HORIZONTAL TANDEM COMPOUND ENGINE, Condenser, Well Pumps, and all Accessories.

Copies of the Specification and Plans can be obtained at the Office of the Council's Consulting Engineer, Mr. Percy Griffith, M.Inst.C.E., F.G.S., 54, Parliament Street, Westminster, S.W., on payment of a deposit of £5, which will be returned to those from whom *bonâ-fide* Tenders shall have been received on or before the date hereafter named. Early application is necessary, as only a limited number of copies will be issued to Contractors.

Sealed Tenders, on the Form provided for the purpose, must be delivered at the Offices of the Council on or before the 11th of March, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
L. A. SKINNER,
Clerk of the Council.

Council Offices, Broadstairs,
Feb. 16, 1905.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Company's Offices, No. 3, Lothbury, in the City of London, on the afternoon of Tuesday, the 7th day of March, 1905, at Three o'clock, to receive the Report of the Directors, and for the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 14th of February to the 7th day of March inclusive.

By order of the Directors,
WM. B. PEAT,
Secretary.

3, Lothbury, London, E.C.,
Feb. 25, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

NEW ISSUE OF £20,000 NEW ORDINARY "B" STOCK, and £6500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GAS SHARES.

WOKING DISTRICT GAS COMPANY, LIMITED, 477 £5 ORIGINAL SHARES,
Ranking for a Maximum Dividend of 10 per cent., at present receiving 7 per cent. per annum.

ASCOT DISTRICT GAS COMPANY, 170 £10 SHARES,
Ranking for a Maximum Dividend of 10 per cent., now receiving 5 per cent. per annum.

TO BE SOLD BY AUCTION, BY

MR. ALFRED RICHARDS, at the Mart., E.C., on Tuesday, March 7, at Two o'clock, in Lots, by order of the Executor of Mrs. F. Williams, deceased.

Particulars of Messrs. A. F. CHURCH AND SONS, Solicitors, 51 and 52, FENCHURCH STREET, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CARDIFF GASLIGHT AND COKE COMPANY.
(INCORPORATED THE 5th OF MAY, 1837.)

THE Directors of the Cardiff Gaslight and Coke Company are prepared to receive, not later than Tuesday, the 7th of March, 1905, at 11 a.m., sealed TENDERS for £8500 "D" STOCK, bearing a Maximum Dividend of 5 per cent. per Annum, in pursuance of the powers of the Cardiff Gas Act, 1887.

Conditions and Form of Tender, together with any further Information, may be obtained on application to the undersigned.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff, Feb. 1, 1905.

THE Derwent Valley Water Board is prepared to receive a LIMITED AMOUNT OF MONEY, upon Mortgage, at £3½ per cent. per annum, either for a Term of Years, not exceeding seven, or Repayable at Six Months' notice from either party.

The Moneys required for carrying out the Works of the Board are secured upon the Revenues and Rates of Derby, Leicester, Nottingham, and Sheffield in due proportion.

Applications to be sent to Mr. W. Gill Hodgson, Accountant to the Board, Bamford. *vid* Sheffield.

By order,
O. B. STEWARD,
Clerk to the Board.

ESSEX,
ADJOINING HEDINGHAM RAILWAY STATION (C. V. R.), WITH POSSESSION FROM LADY DAY, 1905.

MESSRS. BALLS will Sell by Auction, at the Mart, Tokenhouse Yard, London, E.C., on Monday, March 6, 1905, at One o'clock,

The Freehold Property, with Foreman's Cottage, known as the HEDINGHAMS GAS-WORKS, with its Mains, Service Pipes, and Meters, as a going Concern.

Printed Particulars and Conditions may be obtained of the Solicitors, Messrs. MORTON AND SON, Halstead, ESSEX, and of Messrs. BALLS, Auction and Estate Offices, Castle Hedingham, ESSEX, and Haverhill, SUFFOLK.

ST. NEOTS, HUNTS,
On the G.N. Rly. Main Line, 50 miles from London.

MESSRS. MADDISON & SON, have been favoured with Instructions to SELL BY AUCTION, on Friday, March 10, 1905, at the Meter-Works, Brook Street, and the Vulcan Iron-Works, Market Square.

An extensive and valuable collection of Patterns in Wood and Metal, used in the erection of Gas-Works in any part of the World, with some hundreds of Zincos and Electros, Tracings, Prints, detailed and finished Drawings for the Complete Equipment of Gas and Meter Works for cities, towns, villages, factories, and private residences, comprising Retorts of all kinds, Air and Water Condensers, Scrubbers and Washers, Engines and Exhausters, Hand and Power Pumps, Purifiers, Gas and other Valves, Station Meters, Governors, Gasholders and Tanks, Consumers Wet and Dry Gas-Meters and Prepayment Meters, Lamp Columns and Brackets, Shadowless and Interchangeable Street-Lanterns, Air-Pumps, Gas-Heating and Cooking Stoves, Carburettors, Gas and Water Mains, Hot Water and Steam Heating Apparatus, a large quantity of new rising Plug and Through-Way Valves, Centre Rack and other Valves, Gas-Governors, Meters, Castings, Street-Lamp Fittings, Omedwor Gas-Stoves, Office Furniture, Gas-Testing Apparatus, Smith's Forges, 8-Ton Foundry Crane, Cupolas, 10-Horse Power Condensing Steam-Engine, Boilers, Lathes, Shafting and Workshop Machinery, 30 cwt. Weighing Machine, Jib Cranes, a 20-feet Gasholder in Cast-Iron Tank, with Purifiers, Station Meter, Condensers, and numerous other effects.

Sale to commence at Ten for Eleven o'clock prompt.

Catalogues may be obtained of Mr. E. BURDEN, Engineer, St. Neots, and of the AUCTIONEERS, St. Neots, HUNTS.

RICKMANSWORTH GAS COMPANY.

WINDING UP.
NOTICE TO CREDITORS.

NOTICE IS HEREBY GIVEN, that all Creditors of the above Company must send in their accounts due up to the 30th of September, 1904, to the undersigned on or before the 11th day of March, 1905, after which latter date the Directors of the above Company will proceed to wind up the affairs of the Company, as provided for under the Rickmansworth Gas Act, 1903, and will not be responsible for any debts sent in after the said 11th day of March, 1905.

G. J. M. ATKINS,
Rickmansworth,
Solicitor for the Directors.

120 Pages, Demy 8vo., Bound in Stiff Cloth Cover Lettered, Price 5s. Post Free,

THE
VALUATION
OF
GAS, ELECTRICITY, & WATER WORKS FOR ASSESSMENT PURPOSES
— SECOND EDITION —

By THOMAS NEWBIGGING, M.Inst.C.E., and WILLIAM NEWBIGGING, Assoc.M.Inst.C.E.

WITH AN APPENDIX OF DECIDED CASES.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Gas Companies are solicited to try Samples of the

MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and Analysis on application.

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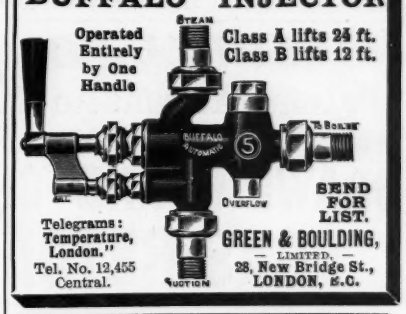

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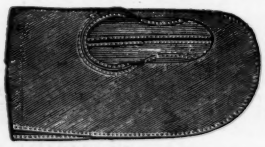

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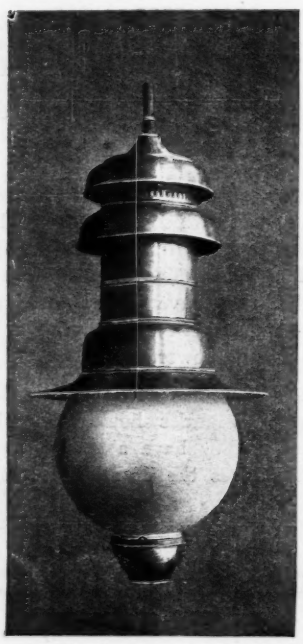

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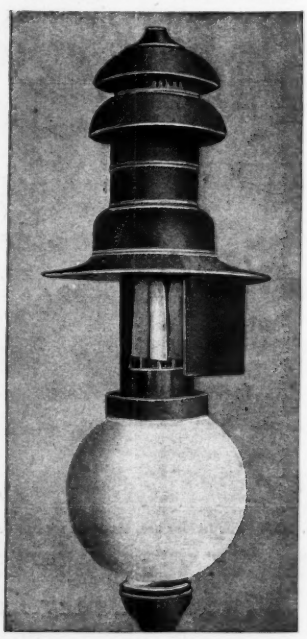
Globe lowered, showing wind-proof shield with door open for access to Mantles. Bottom cup can be removed for Globe cleaning.



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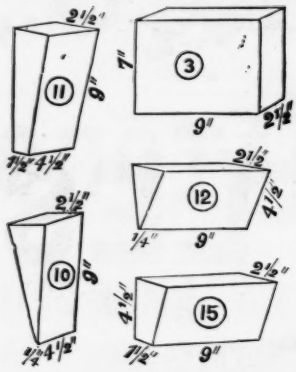

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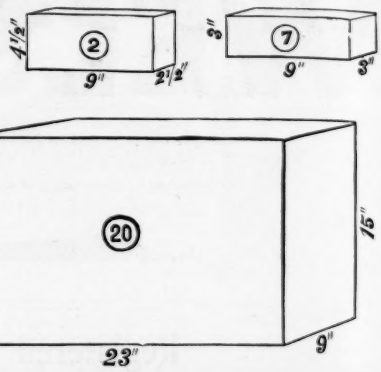

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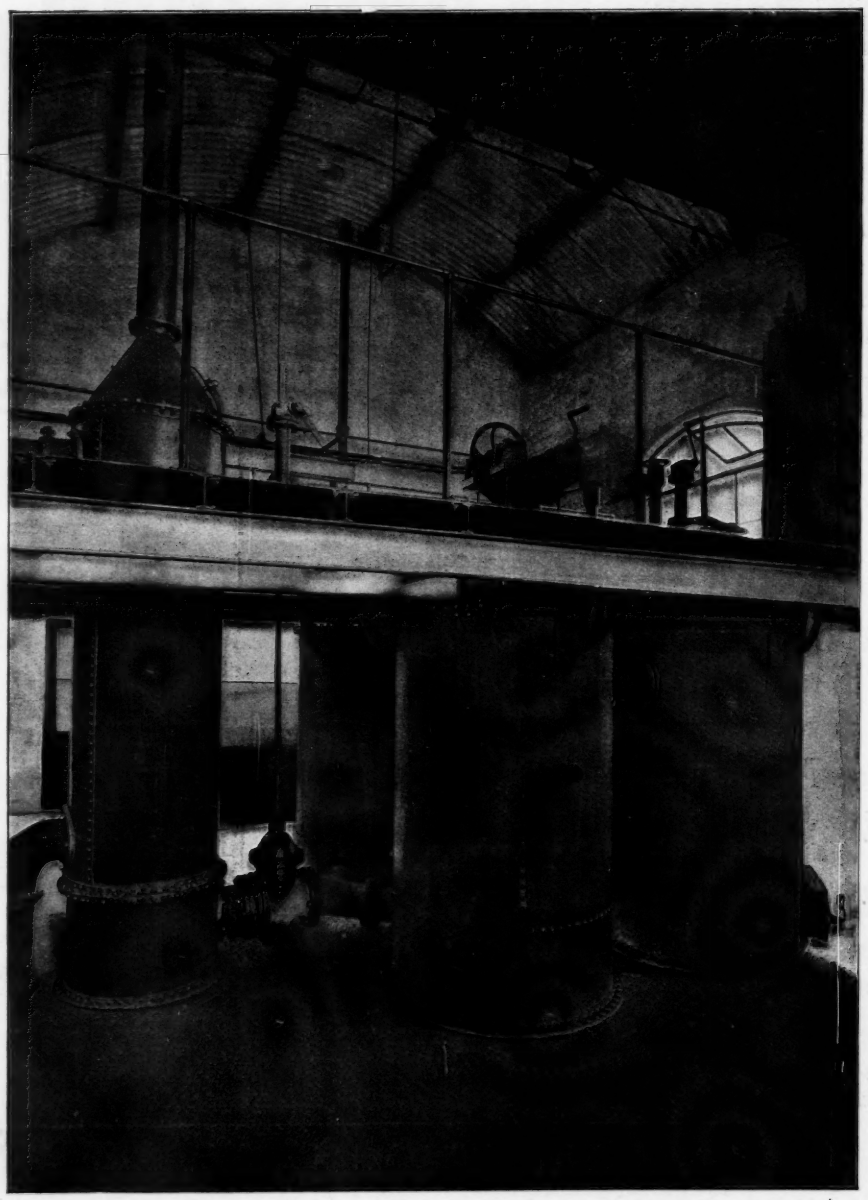

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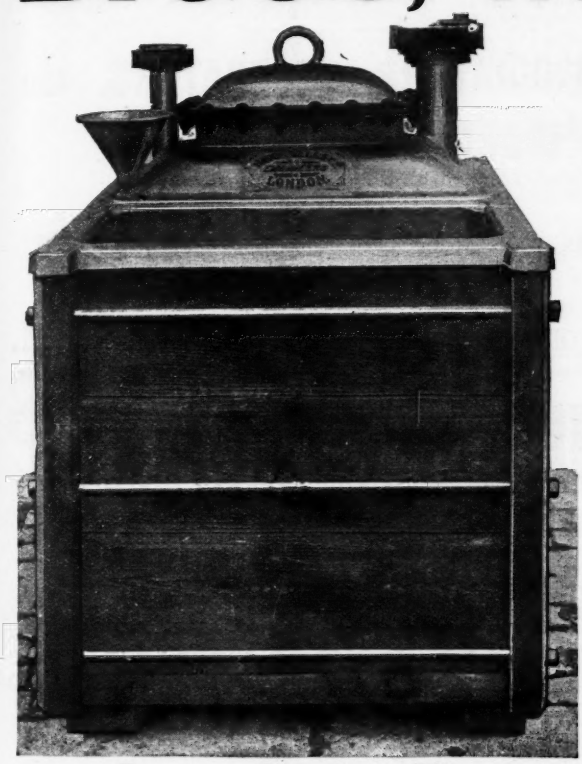

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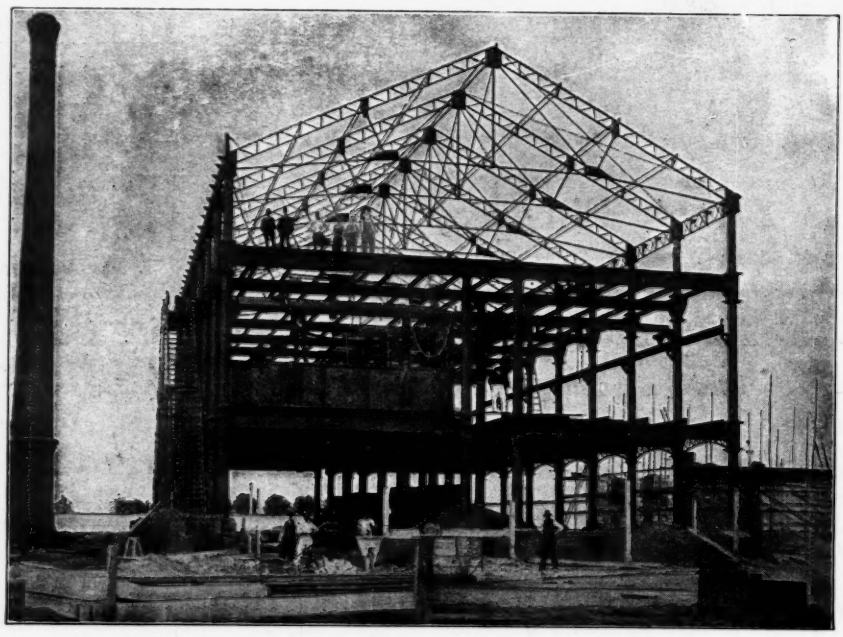

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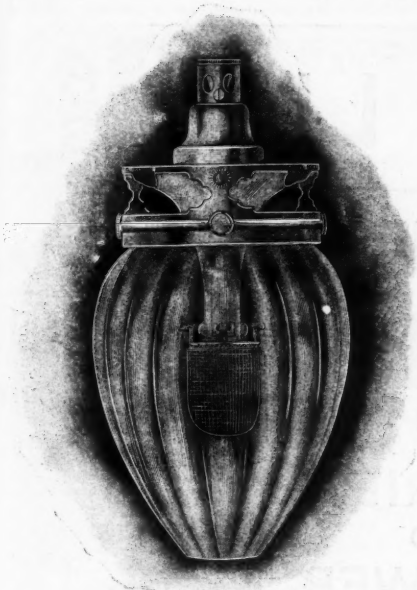

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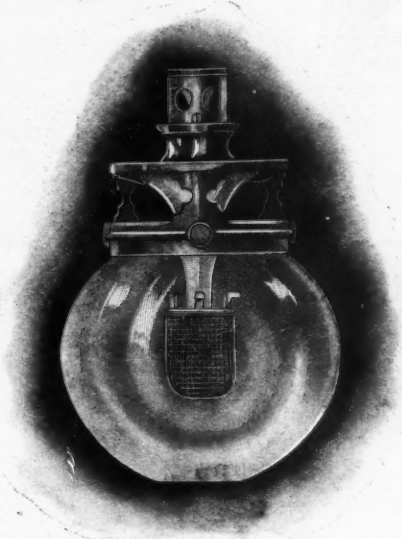

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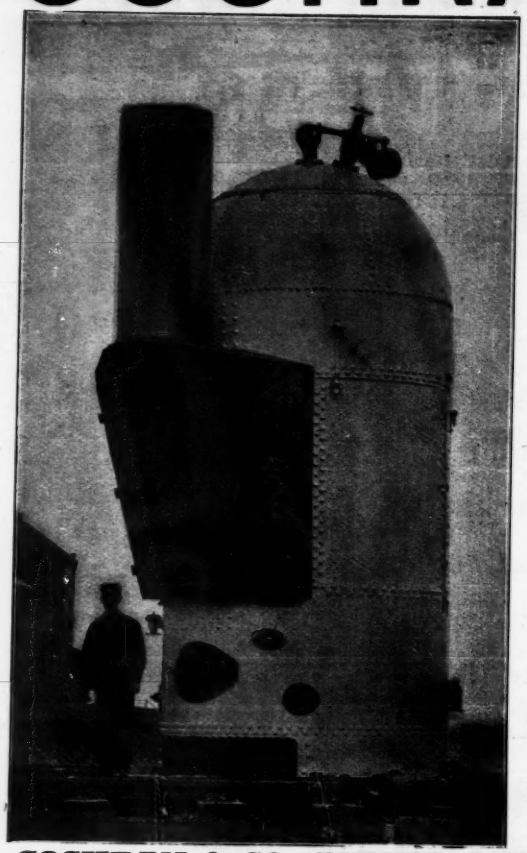

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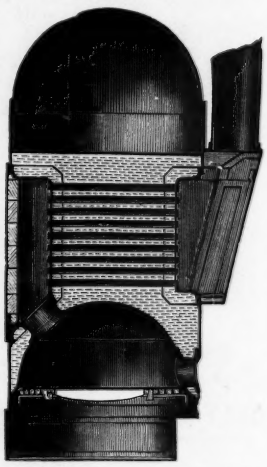

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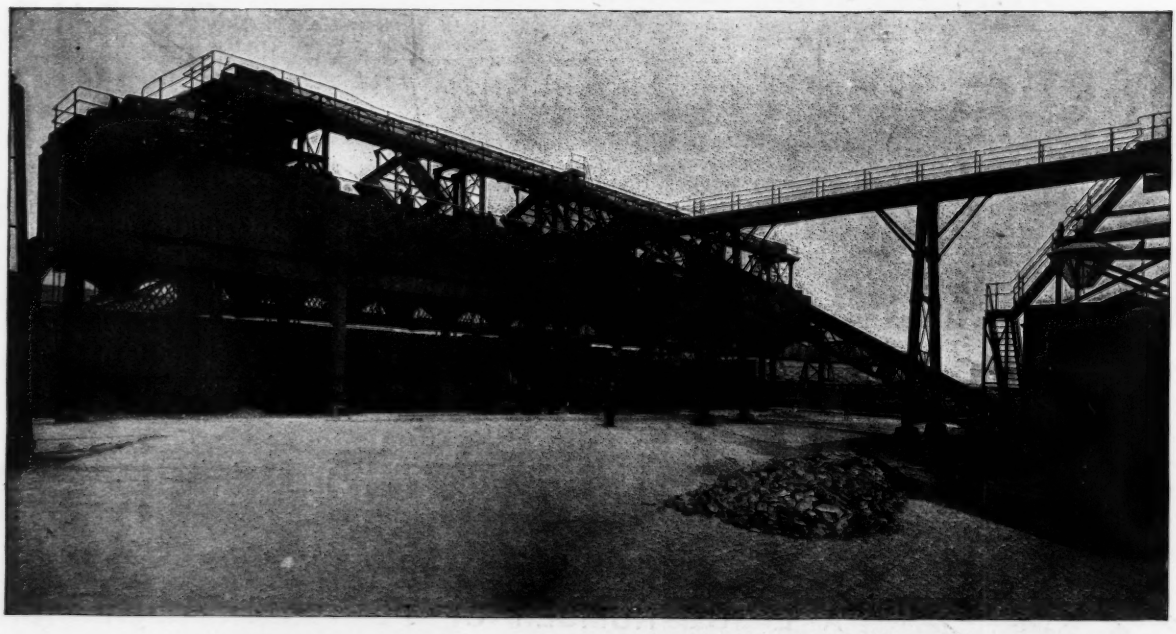

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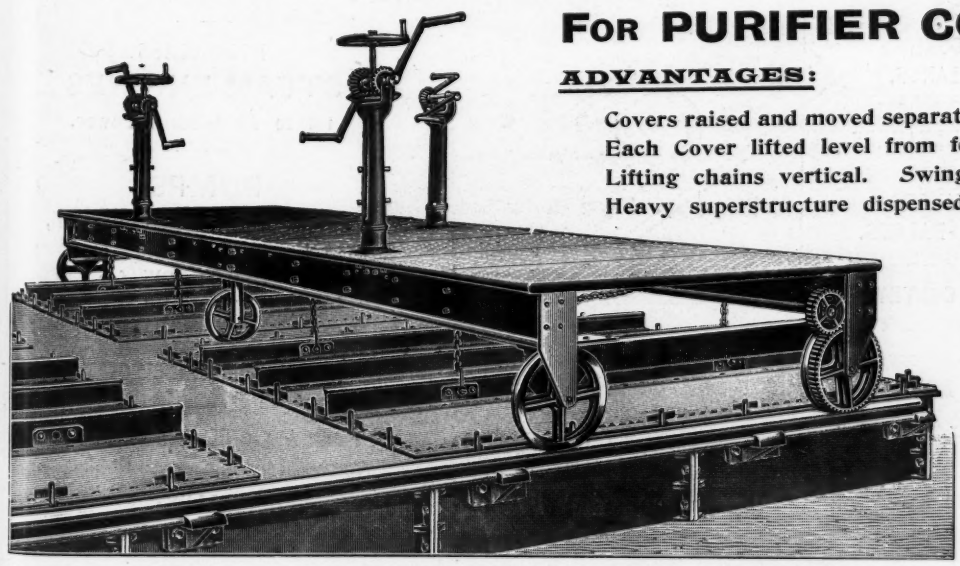

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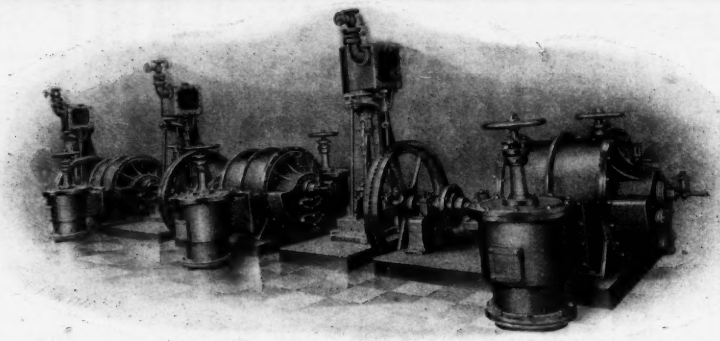

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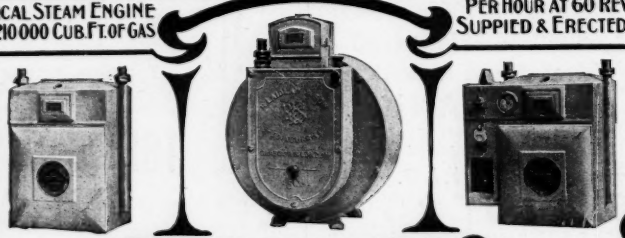

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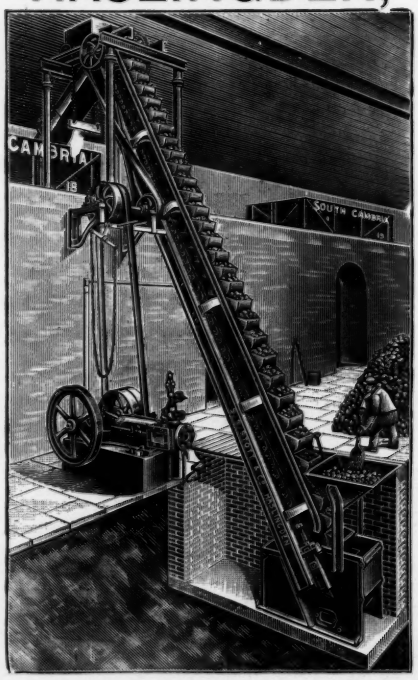

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